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The Chicago, Milwaukee & St. Paul makes its own cast iron wheels. Their present composition is 40 per cent. pig iron and 60 per cent. scrap, the latter being 11.1 per cent. new scrap (brake heads and bad wheels) and 48.9 per cent. old wheels. For the fiscal year 1908 the average service for passenger wheels was 86,800 miles and for tender wheels, 51,425 miles, the greatest single cause for removal of the latter being sharp flanges. The Pennsylvania also makes its own wheels, and from some figures recently quoted by Mr. Gibbs, General Superintendent of Motive Power, it appears that the average total mileage for wheels drawn for causes other than "brakes" and "brake burns," is for wheels under passenger coaches 56,860 miles, and under baggage, express and postal cars, 69,854 miles. The total drawn for all defects gives an average under coaches of 29,479 miles and under baggage, express and postal cars, of 50,247 miles. Therefore, 25 per cent. of the wheels are drawn for flat sliding and 38 per cent. for brake burns, making a total of 73 per cent. drawn for these two causes. No comparison of the figures from the two roads mentioned can be made, however, as all the particulars of the service, such as the severity of the same, the percentage of wheels under local trains in which frequent and severe stops are necessary to maintain the schedules, local rules governing the withdrawal of wheels from service, etc., must be known before this can be done. In passenger service, each motive power man is the judge of what he requires for safety, there being no general rules as in freight service. This is illustrated in the relative mileages on the Pennsylvania for coaches on the one hand and baggage, express and postal cars on the other. One reason for the difference is that a much greater percentage of the coaches is in local service, where they encounter the severest braking conditions, whereas the other classes of cars mentioned are mostly on the through, non-stopping trains. The Pennsylvania uses mostly steel wheels under tenders so that figures cannot be given for cast iron wheels in that service.

Harper's Weekly, in its issue of November 28, devoted four and one-half columns to telling of the work B. F. Yoakum, of the Rock Island-Frisco Lines, has done during the past two years, in educating public sentiment about railway matters. The tribute paid to Mr. Yoakum is deserved. He has rendered a service to the roads and the public by his writings and addresses. He has indulged in no diatribes against governmental regulations *per se*, but with great common sense has frankly recognized that it has come to stay, and has sought only to show wherein present policies are wise or unwise and how they should be modified to get the best results for the public. He has not only told the people and railway employees in his many public utterances that they cannot afford to let shippers, politicians, legislatures and commissions go on unfairly attacking investments in railways, but in a sane and conciliatory tone he has given convincing facts and figures to show why and wherein the interests of the carriers, their employees and the public are mutual. Several prominent railway executives, including Mr. Yoakum, James J. Hill, E. H. Harriman, W. C. Brown, W. W. Finley, F. A. Delano, Robert Mather, T. P. Shonts and others, have done yeoman service in a campaign of education that has made the public more enlightened to-day on railway questions than it ever was before. Such men as these not only speak with knowledge, but owing to their conspicuity they can get a hearing through the press for the railway side of the case when others cannot. They can render no more valuable service to the properties intrusted to their management than to continue to take advantage of every good opportunity to explain railway methods and tell railway needs. Past experience teaches that it is cheaper and better to prevent the passage of vicious laws by reaching a friendly understanding with the public than to try to overthrow them after they are passed.

THE MALLET COMPOUND LOCOMOTIVE.

In the paper presented to the recent meeting of the American Society of Mechanical Engineers, and published in another column, Mr. Mellin, of the American Locomotive Co., gives a resumé of the development of the Mallet articulated compound locomotive, and from it draws the conclusion that it "represents the highest development of this branch of engineering." It is a concise statement of what has been done in the United States with this type of construction, dealing for the most part with mechanical features, to the almost total neglect of operation, merely scheduling the weights hauled and the grades upon which the work is done. From the fact that orders have been repeated, however, and that complaints have been few, it is evident that Mallet articulated compounds have been well thought of for their mechanical operation. It would be interesting, from every point of view, to know as much about the economic, as we do about the mechanical record of these engines.

It appears, however, that the doctors are not yet quite agreed as to the value of, and necessity for, a truck in connection with the simple pair of rigid wheel bases of the original design. It is urged that, inasmuch as the front set of wheels is a truck in itself, the addition of a truck to this truck would be a superfluous appendage, and this position is supported by the statement that, in all the locomotives built, there has never been the slightest apparent need for a truck-

grinding wheel. On the other hand, the advocates of the use of the truck are emphatic in their claims for its desirability, but rest upon simple assertion without setting up anything in the way of a demonstrative truth. We have no statement of the comparative wear of the wheels of these engines with and without trucks, to show that flange cutting or rail distortion is more or less pronounced with one than with the other. So far as we know, there has never been any investigation to indicate whether the truck of a Mallet compound relieves the wheels at all or not, or to show the effect of the rear truck on the rear set of wheels, which, in the case of a 2-6-6-2 locomotive, presents the condition of an ordinary mogul running backward, with the exception of the grinding effect of the front frame at the point of articulation. It appears, then, that we have no data upon which to decide, for it is quite evident that the two sets of wheels influence each other's running, but to what extent we do not know. It looks as though it might be worth investigating. Attention is especially directed to this point, because it is the one, and apparently the only one, upon which a difference of opinion exists.

There was one item of interest brought out in the discussion that relates particularly to the American development of the type. Attention was called to the fact that the original design was intended solely for use on tortuous narrow-gage roads that were almost portable in character, as in the case of the Decanville construction, and that the American designer had broken away from the precedents set up by the light work, and at a single bound had produced the giant machine weighing 350,000 lbs., that served to introduce the type to the railways of this country. It was a bold solution of a great problem, and the results have shown an admirable adaptation of the fundamental ideas to the requirements of the service. From this it was a comparatively simple matter to produce the lighter engines that have been built, where a concentration of weight and flexibility for use over crooked tracks has been demanded. The growth of the application of the principle is quite natural, though perhaps unexpected, for it was at first thought that, having shown its fitness for very heavy work, the applications would be limited to that character of service.

But, instead of this, we first have a fairly wide range of construction for freight work, followed by a consideration of the adaptability of the machine to passenger service. This was certainly not generally looked for at the time of the construction of the Baltimore & Ohio engine. Both of the large locomotive companies have designed passenger locomotives of this type, and some are being built. They are, of course, intended for work on heavy grades, and with the comparatively low speeds for which this service calls, there can be no doubt about their successful performance. Whether they will ever be worked on really high-speed lines is doubtful; because, under such conditions, the compounding fails to give the same economy as at low speeds, and the advantages of high adhesive weight would be lost, while the multiplicity of wheels would be a disadvantage.

Enough has been done, however, to demonstrate the usefulness of the type and to give basis for the extravagant sounding eulogies that have been pronounced. The Mallet articulated compound appears likely to take its place before long in regular road service and supplant the consolidation that is now the standard for heavy freight work. Whether the articulated compound will come down from the hills and become a standard type on level tracks, remains to be seen. If it does it will probably be because it has shown an economy in rail and wheel wear and stresses, and in maintenance of which figures are now lacking and not because the haulage of very much heavier trains is desired. It is possible that this may occur, but of that the future must decide. At any rate, the type has evidently become firmly established, and its application will undoubtedly be wider than it is now, because of the great variety of conditions to which it is adapted.

THE CONVERTIBLE RAILWAY BOND.

An examination of the bond sales at the New York Stock Exchange during a recent and typical week shows that out of total sales of all kinds of bonds—government, foreign, municipal, railway and industrial—amounting to nearly $40,000,000 at par, the group of railway convertible bonds sold amounted to somewhat more than $5,000,000, or more than 12 per cent. If the total of railway bonds alone were taken as a basis the ratio of convertibles would, obviously, rise considerably higher. Big railway corporations, all paying dividends, are represented strikingly in the "convertible" bond list. These companies include the Pennsylvania, the Union Pacific, the New Haven, the Atchison, the Norfolk & Western and the Delaware & Hudson; and bonds, to an amount not small, have their date of issue within the "panic period" or near it. The conclusion seems irresistible that the convertible bond is coming more and more into use as a form of railway finance and, as such, deserving of somewhat specialized attention.

The convertible bond issued in such volume has, of course, taken many shapes. Sometimes it has been made convertible into one class of stock, sometimes into another. Sometimes it is a high rate interest bond, sometimes low, but usually the latter. The period to convertibility and the convertible ratio also vary much; and a case could be cited where the time of convertibility rests on the will of the directors, though the bond in this instance does not happen to be a railway bond. Such a bond as this last has clearly and peculiarly the peril of being open to speculation by insiders. The convertible railway bond is, naturally, a junior bond and, often a debenture, or corporation note of hand, unsecured by property lien, the convertibility being, in a sense, a substitution for the lien in order to make the bond "go" in the market. In one instance that could be specified a large railway corporation not long ago over a period of several months' duration made an issue of debentures amounting to some $24,000,000 and already long outstanding convertible into its common stock. The stock fell and checked the conversion. But, if the stock rises hereafter the conversion privilege is pretty sure to be renewed. Thus we are coming to have all shapes, sizes, times and plans of convertibility, the railway corporations, after a rough fashion, repeating the history of the life insurance companies when their old line "straight" policies began to shift into the "tontines" and other forms of insurance to suit the status or taste of the individual insured.

The causes of the rise of the convertible bond are easily sighted. With general or senior mortgage bonds outstanding the corporation needing new funds seeks a kind of "snapper" on a new loan as an inducement both for outside investment and for its own stockholders who, if their corporation is a good dividend payer, are apt to take up their "rights" and to that extent furnish the funds. With its tendency thus to hold old stockholders the convertible bond commends itself to boards of directors even though, as compared with a low rate mortgage long time bond it costs more in interest or, if converted, costs more in the dividend. Directors prefer, in other words, to lend to their stockholders before the outside investing public and to give them ultimate or immediate "melons" if a crop of that railway fruit is in sight. But the real charm of the convertible railway bond strikes deeper into the psychology and sentiment of investment. It has a kind of "heads I win, tails I don't lose" quality. The owner of the convertible bond enjoys somewhat of the speculative emotion without its serious risks. If the stock rises he sees his bond rise too; if it falls his bond falls also but not often below a certain investment rate point; and when the time of convertiblity comes he can, in the familiar phrase, "hold for investment" if the stock is low or convert—or sell—and take his profit if the stock is high.

But the convertible railway bond has now begun to enter more actively into a cycle of investment not altogether so

satisfactory to the corporation that has adopted the plan. If the bond has a considerable time to run before convertibility it is apt to fall below the ratio of value to the stock based upon the presumptive value of the stock at the time of convertibility. Here steps in the shrewd broker. He addresses the old conservative holder of the stock who expects to hold it through good and ill. He shows that stockholder, per circular in figures which do not lie, that by selling his stock, buying its convertible equivalent in bonds, holding, say, 10 or 15 years to convertibility, and reinvesting the balance over the sale, he can enjoy a return better secured by the bond and equivalent to the uncertain dividend, and can also pocket, when convertibility comes, a handsome profit besides. Thus the convertible bond operates as a "drag" upon the stock and there is a speculative swing to and fro between them, but, on the whole, with some injury to the credit of the railway corporation whose shares rather than convertible bonds are the criteria of its financial standing; and with the stock and bonds become more speculative as tested by their fluctuating price in the market.

Such a situation introduces us to a new aspect of railway finance, a logical outcome of pre-existing conditions, and more interesting, perhaps, than serious so long as the convertible bond fills but one corner of the railway security market. Future complications of a more important nature depend upon the degree to which the railway convertible bond theory and practice expand in a period when outstanding senior mortgages compel extensive resort to junior securities for raising money.

SHIPPERS' RESPONSIBILITY FOR LEGAL RATES.

The National Industrial Traffic League will ask Congress to amend the Interstate Commerce Act this winter so as to provide that officers and agents of the carriers must quote rates in writing on application and be responsible therefor. Reparation for errors, it is proposed, shall be made by claim through the Interstate Commerce Commission. If a representative of the carrier quotes a rate less than than the legal rate the road shall not only be compelled to protect the lower rate, but shall also be fined its entire earnings on the traffic.

The decision of the United States Circuit Court of Appeals for the Seventh Circuit in the case of the government against the Standard Oil Company of Indiana modified previous views of the responsibility of shippers for unwittingly using illegal rates. Judge Landis, of the federal district court, held in this case that the shipper who used an illegal rate must be presumed to have known that it was illegal—that "he must know what he can ascertain by inquiry"—and that he could be punished for rebating without it being shown that he actually knew that the rate he used was unlawful. The Interstate Commerce Commission seems to have taken a similar view when it decided the case of A. J. Poor Grain Co. v. C., B. & Q. *et al.* (12 I. C. C. Rep. 418). But the Circuit Court of Appeals, in reversing the decision of the lower court in the Standard Oil case, said that while the doctrine that "ignorance of the law is no defense" is perhaps applicable to the carrier accepting an illegal rate, the guilty knowledge and criminal intent—necessary elements of a criminal act—of a shipper who uses an illegal rate cannot be presumed, but must be proved by evidence, like other material facts. The distinction between the railroad and the shipper was drawn by the court upon the theory that the agents of the former have a better opportunity to know the legal rate than have the latter. This is not always true. The occasional shipper knows so little about railroad tariffs that he must rely upon the representative of the railroad to interpret them for him; but the large shipper, who handles only one or a few commodities, and who often has a traffic expert to advise him, frequently has as good facilities for ascertaining the legal rate as the railway has, or better.

Under the law as construed by the Circuit Court of Appeals there is no serious danger that a shipper who innocently uses an illegal rate may be punished criminally. The law in this respect bears less hardly upon shippers than upon railroads. But, it is contended, the fact still remains that if the shipper sells goods at a price based on a rate quoted to him by the railroad, and later finds that the quotation was erroneous, and that he must pay the higher legal published rate, he may lose the entire profit or more than the profit that he expected to make on the sale. The number of erroneous quotations of rates is small compared with the number of quotations constantly made. There is also a great deal of exaggeration of the extent to which freight rates enter into the prices of commodities. Ordinarily the freight rate paid for the transportation of a commodity is a good deal less than the profit made from its sale. It would take a bad blunder in quoting a rate to wipe out all the profit on a shipment unless it was a shipment of a low grade commodity that was being sold on an uncommonly narrow margin. However, nobody will deny that the railroad and not the shipper should be made to lose by the railroad's mistakes if this can be done without causing evils worse than those it is sought to cure.

One of the first results of the legislation the League asks would be a multiplication of applications for quotations of rates in writing. The shipper would have everything to gain and nothing to lose by demanding such quotations. If the rate quoted were higher than the legal rate he would not have to pay it; if the rate quoted were lower than the legal rate the shipper would gain the difference. The shipper now has an incentive to take care to ascertain the legal rate in the fact that he may lose money if he makes a sale on the basis of a less than the legal rate. Under the law as it is proposed to amend it he would have no such incentive. He could lose nothing and might profit by being negligent. The law, while heavily penalizing carelessness by railroads, would put a premium on carelessness by shippers.

A far worse feature of the proposed legislation is the temptation it would place before the railroad men and shippers to renew rebating. The shipper and the railroad officer or agent could easily arrange that the latter should quote the former an illegal rate in writing, that the road should collect the higher legal rate, and that the shipper should then put in a claim for the difference. In most cases such a claim could be put through the office of the Interstate Commerce Commission without the unlawful collusion between the shipper and the officer or agent of the railroad being detected. It will be said that fining the railroad the full amount of its earnings from the shipment would prevent "mistakes" of this sort. It would prevent the responsible management from making them; but it would not restrain individual officers or agents from making them, especially if the shipper were to share with the representative of the railroad what he gained through the unlawful concession.

It will not answer to say that men would fear to violate the law—that the evil days of rebating are past. Efforts have been made in this country for 21 years to stop rebating. They have failed heretofore not merely because there were railroad men who were willing to violate the law but very largely because shippers have evercised all their ingenuity to devise ways to evade the law or to violate it without detection and have brought heavy pressure to bear upon traffic officials of railroads to secure their collusive and unlawful co-operation. That pressure is not absent to-day. It would be greatly increased under the law as it is proposed to amend it. As Commissioner Harlan said, in rendering the opinion of the Interstate Commerce Commission in the Poor case:

> "To permit shippers to impute negligence to carriers in quoting rates and on that ground to enjoy the rate quoted instead of paying the lawfully publish rate, would open a broad and ample way for the payment of rebates and for other unlawful practices, and might, in its practical results, work a repeal of the essential feature of this (interstate commerce) legislation."

This is a period of transition in the making of railroad

tariffs. The orders of the Interstate Commerce Commission regarding the printing and posting of tariffs have made the traffic departments of the carriers an immense amount of extra work. It has been necessary to hire many inexperienced clerks and to do the work at a speed that would have made it hard for experienced clerks to do it well. In consequence, an unusual number of mistakes recently have been made both in printing tariffs and in quoting rates. When this transition period is past, the mistakes that shippers complain of will become fewer. It is better that shippers should bear the trouble and losses the law causes as it stands than to take the risk of so amending the act that the worst evils it was meant to remedy may be revived.

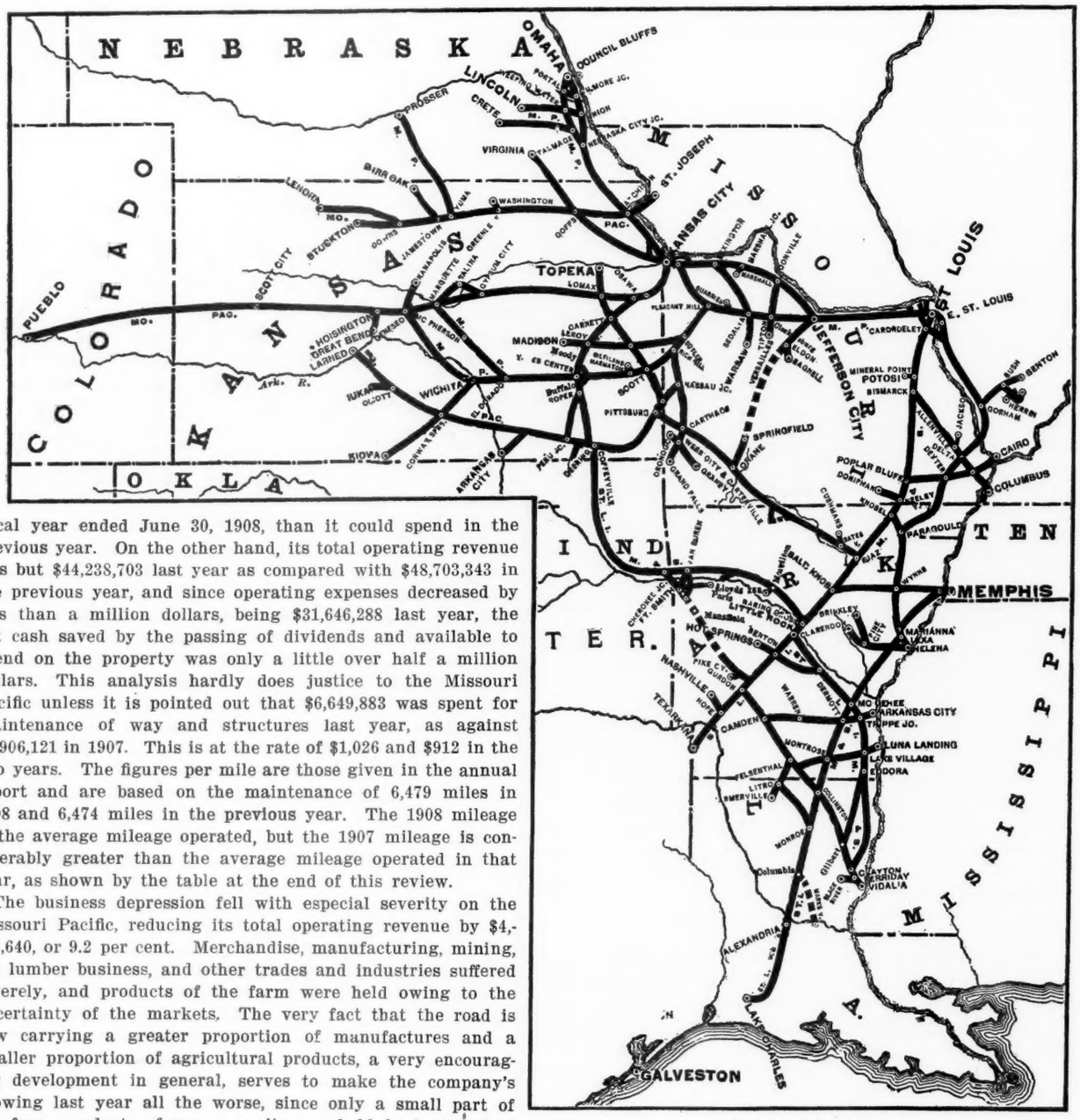
MISSOURI PACIFIC.

The policy of the Missouri Pacific in declaring a 2½ per cent. dividend payable in stock, and entirely passing the second semi-annual dividend, gave the company $3,890,875 more cash to spend on the property, or for expenses, during the fiscal year ended June 30, 1908, than it could spend in the previous year. On the other hand, its total operating revenue was but $44,238,703 last year as compared with $48,703,343 in the previous year, and since operating expenses decreased by less than a million dollars, being $31,646,288 last year, the net cash saved by the passing of dividends and available to spend on the property was only a little over half a million dollars. This analysis hardly does justice to the Missouri Pacific unless it is pointed out that $6,649,883 was spent for maintenance of way and structures last year, as against $5,906,121 in 1907. This is at the rate of $1,026 and $912 in the two years. The figures per mile are those given in the annual report and are based on the maintenance of 6,479 miles in 1908 and 6,474 miles in the previous year. The 1908 mileage is the average mileage operated, but the 1907 mileage is considerably greater than the average mileage operated in that year, as shown by the table at the end of this review.

The business depression fell with especial severity on the Missouri Pacific, reducing its total operating revenue by $4,464,640, or 9.2 per cent. Merchandise, manufacturing, mining, the lumber business, and other trades and industries suffered severely, and products of the farm were held owing to the uncertainty of the markets. The very fact that the road is now carrying a greater proportion of manufactures and a smaller proportion of agricultural products, a very encouraging development in general, serves to make the company's showing last year all the worse, since only a small part of the farm products of a community are held back in a bad year, while the shipment of manufactured products and of building materials may be almost entirely discontinued during considerable periods. The classification of freight traffic cannot be compared with the freight traffic during the last few years since no figures were given in those years, but the following table is of interest in itself, showing the character of the business of a railroad running through an extremely fertile farming country originating considerably more traffic than it consumes:

Classification.	System tonnage.	Per-centage.
Products of the forest	3,256,211	19.2
Animals and animal products	896,151	5.3
Agricultural products	5,408,028	20.2
Manufactures and mdse.	3,201,966	18.9
Coal	3,441,063	20.3
Miscellaneous	2,717,322	16.1
Total	16,920,741	100.0

This traffic was handled by freight trains running 13,183,604 miles, a decrease of about 4 per cent. from the freight train mileage of 1907, the average train load being 285 revenue tons in 1908 and 310 revenue tons in the previous year. Not only



Missouri Pacific.

did the number of tons of revenue freight carried decrease considerably, the figure for 1908 being 16,920,741, or 7.5 per cent. less than in 1907, but the average distance each ton was carried decreased from 244.55 miles to 234.65 miles, a decrease of 4 per cent. And while the average number of loaded cars per freight train decreased 6 per cent., being 16.6 cars last year, the number of empty cars per train total 7.5, an increase of 29 per cent., the mileage of empty cars being 90,999,740 in 1908, an increase of 30 per cent. This in itself helps to explain the company's inability to cut down operating expenses in proportion to loss in traffic.

Another factor that added to operating expenses without increasing the revenue was an increase in the number of passengers carried from 9,496,531 in 1907 to 10,361,498 last year, while the amounts received per mile from each passenger were 2.24 cents in 1907 and 1.92 cents in 1908. This decrease in passenger revenue was brought about largely by hostile legislation in the states through which the Missouri Pacific operates, and the company is now engaged in testing the constitutionality of the orders of the various state commissions which have reduced its passenger and freight rates.

The increase in maintenance of way expenses has already been mentioned, and both traffic and transportation expenses also increased, the transportation expenses by $575,515, or 3.48 per cent., being 17,084,872 last year. In the last half of the previous fiscal year the company was forced to increase its scale of wages in many departments, and this increase, felt only slightly in the previous year, was partly responsible for the heavy transportation expenses last year. The annual report makes no mention of labor troubles during the year, but the daily papers published accounts of strikes on different parts of the road last year, these labor troubles probably costing the company a good deal of money, which would be charged to transportation expenses. Maintenance of equipment cost $5,479,486 last year, being 21.7 per cent. less than in the previous year, and in detail shows an expenditure of $1,954 for repairs per locomotive as compared with $3,008 in 1907; $567 for repairs per passenger car as compared with $746 in 1907, and $49 for repairs per freight car as compared with $68 in 1907. These reductions are rather startling notwithstanding the fact that comparisons between the two years may not be strictly accurate.

Beside maintenance of way charges there was spent for additions and improvements to property $2,073,129, the two accounts showing the greatest expenditure being widening cuts and fills, and ballast. How badly improvements, especially heavier rails and more ballast, are needed may be surmised from the statement of mileage of rails and of ballasted and unballasted track, which shows that of the total 3,431 miles of main track of the Missouri Pacific Railway and branches, 1,275 miles were laid with 56-lb. rail and 212 miles with 52-lb. rail. The St. Louis, Iron Mountain & Southern is in a somewhat better condition and the Central Branch Railway in somewhat worse. Of the entire system, 3,201 miles are ballasted and 2,975 miles unballasted.

The income and expenses of the Missouri Pacific system are given both as a whole and separately for the Missouri Pacific and the St. Louis, Iron Mountain & Southern, but there is no combined balance sheet for the different roads making up the system. A comparison of the balance sheet of the Missouri Pacific Railway and the St. Louis, Iron Mountain & Southern shows, however, a decided need for strengthening the cash resources of the companies. There is $3,800,505 cash in the Missouri Pacific treasury or in transit, and $471,767 to the credit of the St. Louis, Iron Mountain & Southern, but there are $2,058,217 vouchers payable, $1,580,067 notes payable, and $3,917,349 loans payable of the Missouri Pacific and $1,448,195 loans payable, due railway companies and individuals, of the St. Louis, Iron Mountain & Southern. Moreover, the sundry accounts collectable of the Missouri Pacific total but $3,615,169, and those of the St. Louis, Iron Mountain & Southern total $441,508; in other words, the current assets of the Missouri Pacific are $7,415,674 against liabilities of $10,475,076, and current assets of the St. Louis, Iron Mountain & Southern are $913,275, with $1,448,195 current liabilities. There are plenty of securities in the treasury of the two companies, so that it would only be a question of getting a fair price for these securities if the company wishes to strengthen its cash assets.

Notwithstanding the business conditions in the country generally, there were established 330 industries of various kinds along the lines of the Missouri Pacific system, these industries having an invested capital of $17,359,700. Among the industries there are 25 cement, brick, stone, roofing and other plants, 89 sawmills and wood-working plants, 15 coal mines, and eight lead and zinc mines. Nothing but a failure to adequately keep up the property or an inability to sell its securities can prevent the Missouri Pacific from sharing in a return of prosperity.

The following table shows the results of operation for the last two years, the figures for 1907 not having been rearranged to correspond to the form prescribed by the Interstate Commerce Commission:

	1908.	1907.
Average miles operated	6,479	6,375
Freight revenue	$31,423,577	$35,509,589
Passenger revenue	8,670,333	9,696,064
Total operating revenue	44,238,703	48,703,343
Maint. of way and structures	6,649,883	5,906,121
Maint. of equipment	5,479,486	6,998,863
Traffic	1,087,667	1,085,745
Transportation	17,084,872	16,509,357
Total operating expenses	31,646,288	32,515,070
Taxes	1,644,057	1,483,949
Net revenue	10,948,358	14,704,324
Gross income	12,130,906	16,758,978
Net income	2,985,716	7,698,103
Dividends	1,935,210	3,890,875
Surplus	1,050,506	3,807,228

MISSOURI, KANSAS & TEXAS.

In his full and very frank discussion of the operation of the Missouri, Kansas & Texas during the past year, published in the annual report of the road, Adrian H. Joline, Chairman of the Board and President, says:

"The remarkable growth and prosperity of the property in the past has been due chiefly to its independence of control by other railway systems, its exceptional location in a fertile and swiftly developing region, and the measures taken to occupy its territory and to provide timely facilities for handling its business."

There may be two opinions as to the advantage, or disadvantage, to the M., K. & T. of control by some other system. From its geological position it would naturally be of use to some of the larger systems; to the Hill lines, for instance.

As to the second point made by Mr. Joline that its prosperity comes from its exceptional location in a fertile and swiftly developing region, there can be no doubt. During the year the United States government removed all restrictions from the sale of some 8,000,000 acres of fertile Indian lands in Oklahoma, the occupation of which by settlers should add enormously to both the freight and passenger business of the M., K. & T.

In the previous year the most noticeable feature of the operation of the road was a decrease in operating ratio from 73 per cent. in 1906 to 68 per cent. in 1907, but this is taken on a basis which includes taxes and additions and betterments in operating expenses, so that to compare the figure for 1907 with that for 1908 it is necessary to subtract additions and betterments and taxes. This makes an operating ratio of 64 per cent. in 1907, as against 71 per cent., the operating ratio in 1908. President Joline says:

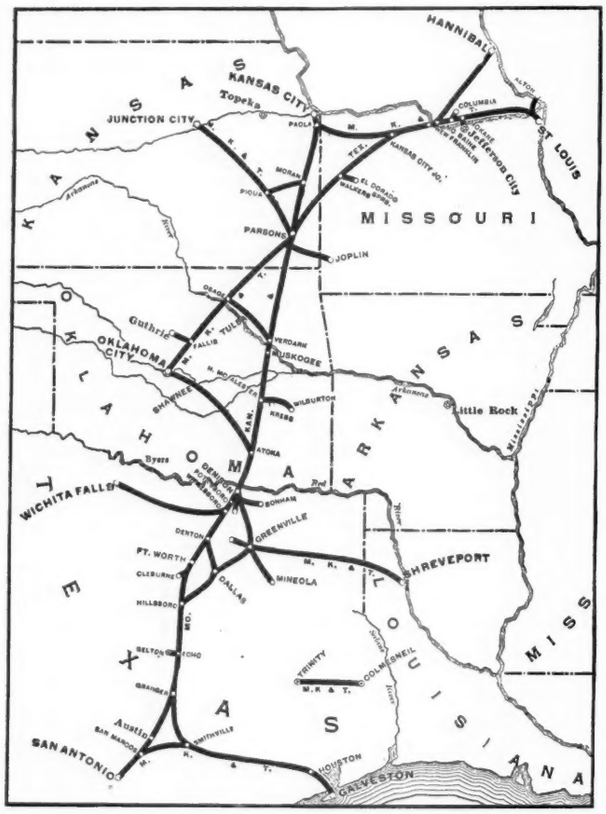
"This increased ratio of expenses, occurring in the face of your management's endeavors to avoid it, shows how difficult, if not impossible, it is for American railways to adjust their expenditures with reference to receipts (under the present rigid system which denies them the right to reduce wages or

to increase rates) so as to maintain a fixed and reasonable margin between them."

The gross revenue for the year amounted to $23,283,670, a decrease of $2,960,289, due entirely to a decrease in earnings from freight traffic. The Katy was peculiarly unfortunate last year, having a bad shortage in the cotton crop and suffering severely from disastrous washouts caused by extraordinary floods occurring almost simultaneously on nearly all sections of the line; this in a year of general business depression.

The passenger business of the road was better than in 1907, and, notwithstanding hostile legislation, the company was able to earn $6,343,935 in passenger revenue last year, as compared with $6,278,608 in 1907. This amount came from the carrying of 210,529,908 passengers one mile, the average revenue per passenger per mile being 2.043 cents last year, as compared with 2.267 cents in the previous year.

The decrease in freight revenue from $18,402,825 in 1907 to $15,400,006 last year, came in part from a decrease in tons



Missouri, Kansas & Texas.

carried one mile and in part from a decrease in revenue per ton per mile. There were 1,709,784,842 tons carried one mile in 1907 and 1,524,135,814 tons carried one mile in 1908, while the rate per ton per mile was 1.076 cents in 1907 and 1.010 cents in 1908.

The tonnage of cotton carried in 1907 was 348,996 tons, or 5 per cent. of the total tonnage, and 198,419 tons in 1908, or slightly over 3 per cent. of the total tonnage. The tonnage of grain also was much smaller last year than in the previous year and amounted to but 423,133 tons last year. Coal is the only article whose tonnage shows any marked increase, and as this is probably by no means the most profitable business that the Katy does, it was not much of a help toward earnings.

The details of expenditure were not rearranged for 1907, so that a comparison may be slightly inaccurate. As shown by the figures published in the two annual reports, there was spent $3,109,503 for maintenance of way last year and $3,467,910 in the previous year, an average of $1,012 per mile in 1908 and $1,129 in 1907. Maintenance of equipment cost $3,039,689, as compared with $2,914,953 in the previous year. A comparison of unit costs of repairs is impossible, since no figures are given in either year. Transportation expenses, which have always tended to make a bad exhibit on the M., K. & T., amounted to $9,643,843, or over 41 per cent. of total revenues. This includes traffic expenses, which were also included in the $9,903,801 transportation expenses in 1907, so that in 1907 this item of expense was something less than 38 per cent. of the total operating revenues.

The increase in expenses for maintenance of equipment, together with the acquisition of 32 locomotives, 11 passenger cars, 2,299 box cars, 1,074 coal cars, 135 refrigerator cars, 34 furniture cars and 62 other cars indicate that the company has put itself in shape to handle the expected increase in business to come from good crops and a return of prosperity.

In summing up the outlook for the year, President Joline says of the company:

"Its future solvency and prosperity depend not only upon these leading factors, but also upon the ability of your company to furnish a superior service at a minimum cost. This will require the outlay in various directions of many millions of dollars, much of which it would be unwise, if not improper, to capitalize, and it follows, therefore, that the surplus revenues of the company must be devoted to this purpose. This policy is vital to the well-being of the property, and doubtless will commend itself to the shareholders, who are, of course, the ultimate beneficiaries."

The following table shows the results of operations for the last two years. The totals have been rearranged to correspond to the classification prescribed by the Interstate Commerce Commission, but the detailed figures of expenses have not been arranged, so that the figures for the two years in these respects are not directly comparable:

	1908.	1907.
Average miles operated	3,072	3,072
Freight revenue	$15,400,006	$18,402,825
Passenger revenue	6,343,935	6,278,608
Total operating revenue	23,283,670	26,183,959
Maint. of way and structures	3,109,503	3,467,910
Maintenance of equipment	3,039,689	2,914,953
Transportation	9,045,189	9,903,801
Traffic	598,655	*
Total operating expenses	16,432,108	16,730,562
Taxes	688,243	426,316
Net operating revenue	7,163,319	9,027,081
Gross income	7,544,742	9,204,222
Net income	1,335,275	4,200,883
Additions and betterments	546,444	518,572
Dividends	520,000	520,000
Surplus	268,830	3,162,311

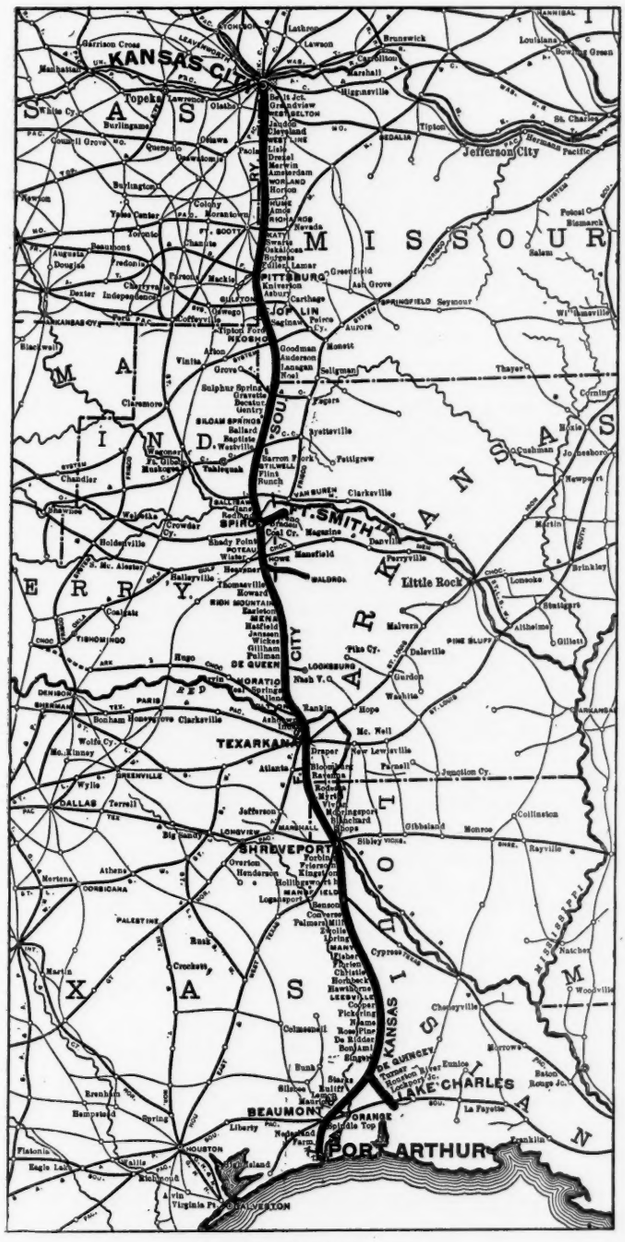
* Included in conducting transportation in 1907.

KANSAS CITY SOUTHERN.

The reports of the three roads lying in general in the same territory are reviewed this week. All three compete in the territory between Kansas City and the Gulf, and all are what are known as southwestern roads, but the roads themselves are of a widely different character. The Missouri Pacific is part of a great railway system and its business must be taken in connection with the other Gould roads, especially the Denver & Rio Grande on the west and the Wabash on the east, to be fully explained. The Missouri, Kansas & Texas is an independent road with branches and feeders, but can hardly be called a trunk line. The Kansas City Southern is also an independent road, but it has all the characteristics of a through trunk line. It is the shortest line singly owned between Kansas City and the Gulf. It has almost no branches or feeders, and depends for its business to a considerable extent on the haul of animal products, wheat and grain, from Kansas City to the Gulf, and on the haul of lumber from the region north of the Gulf to Kansas City. In previous years the preponderance of freight movement has been north, but last year there was a change, and the direction of the heavy movement of freight was south, causing a large increase in empty mileage northbound, due to the rearrangement of the freight car situation throughout the country.

The feature of the operation of the Kansas City Southern in

1907 was a large increase in gross earnings, accompanied by savings in cost of operation, so that the operating ratio was reduced from 73.10 to 58.78 per cent. The 1907 figures have been reclassified to correspond to the 1908 figures, and the operating ratio for 1907 has become 59.24 per cent. Last year the operating ratio was increased to 65.70 per cent. The operations, however, for July and August, since the close of the fiscal year, have been upon a basis of 60.57. The increase



Kansas City Southern.

in operating expenses at a time when business was falling off has been noticed in the other two roads whose reports are reviewed in this issue, but means less in the case of the Kansas City Southern than in the case of most other roads, because the 1907 year for this road was extraordinary in its economy in operation.

Expenses were high because the cost of material and of labor was high. For instance, labor at stations cost $73,976 last year, an increase of 41 per cent. over 1907. Road enginemen handling freight engines were paid $302,621, or 5.5 per cent. more than in the previous year, while the mileage of freight locomotives remained nearly exactly the same; and the fuel for road locomotives cost $727,288, or 7.3 per cent. more than in 1907. Coal cost $1.96 as against $1.77 per ton in 1907. The unit costs of maintenance and repairs are as follows:

	1908.	1907.
Maintenance of way, per mile	$1,051	$1,065
Repairs per locomotive	2,320	3,012
" " passenger car	742	775
" " freight car	74	51

Total operating revenues decreased by $278,618, being $8,758,929 last year, nearly all of this decrease being a decrease in earnings from freight. The business depression easily accounts for this, but unfortunately since there is no classification of freight tonnage given, it is impossible to compare separate classes of freight to get an understanding of just where the road lost business.

The following table gives a few of the more important traffic statistics:

	1908.	1907.
No. tons of revenue freight carried	2,968,145	3,135,712
Average distance each ton was carried, miles	312.55	318.24
Revenue train load, tons	317.75	331.76
Average receipts per ton per mile, cents	0.723	0.699
No. of passengers carried	1,557,058	1,509,935
Average revenue per passenger per mile, cts	2.315	2.377

The total cost of improvements and additions made during the year was $1,666,926. The Kansas City Southern has, in places, heavy grades and sharp curves, which will have to be eliminated if the company is to compete successfully with its neighbors. At the beginning of the year the work of improving the property was pushed vigorously until it became evident that large decreases in business might be expected, and then only such work was carried on as was necessary. If $25,000,000 could be spent on the road, it would probably not only make the earnings of the company enough larger to offset the additional interest charges, but would return a profit as well.

The company sold, in 1906, $5,100,000 negotiable 5 per cent. notes due April 1, 1912, and the total proceeds from this sale has been spent on the property. These notes are secured by $6,000,000 improvement mortgage 4½ per cent. bonds, the total authorized issue of which is $10,000,000, so that the company has $4,000,000 bonds in its treasury which it could sell. The notes are selling in the neighborhood of 97, so that if the bond market continues to improve, the company should have no difficulty in at least financing its present needs, but will require some new issue of securities to give it the money for extensive improvements.

The following table shows the results of operation for the last two years, the figures for 1907 having been rearranged to correspond to the form prescribed by the Interstate Commerce Commission:

	1908	1907.
Average miles operated	827	827
Freight revenue	$6,692,308	$6,970,079
Passenger revenue	1,302,738	1,328,795
Total operating revenue	8,758,929	9,037,547
Maint. way and structures.	917,667	922,927
Maint. of equipment	1,200,480	1,080,839
Traffic	268.550	236,296
Transportation	3,095,791	2,854,614
Total operating expenses	5,754,321	1,354,118
Taxes	283,138	183,849
Net revenue	2,721,469	3,499,579
Gross income	2,855,067	3,577,713
Net income	1,613,272	2,455,339
Dividends	840,000	840,000
Surplus	773,272	1,615,339

NEW PUBLICATIONS.

Power and Power Transmission. By E. W. Kerr. New York: John Wiley & Sons. 366 pages, 6 x 9 in.; 264 illustrations. Cloth. Price, $2.

The contents of this book are not exactly what one would be led to expect from the title. It deals, to be sure, with power and power transmission, in the sense that every prime mover effects a transmission of power to a greater or less extent, and then, too, it does deal with belting, shafting, gearing and the other elementary mechanisms by which power is transmitted from one part of a machine to another.

In the opening chapters it discusses the elements of me-

chanics such as the lever, inclined plane and the cord, into which it divides all simple machines. This is a simplification in the right direction and it is of an advantage to the student to be shown that the underlying principle of the lever, the wheel and axle and gearing is one and the same, rather than to be called upon to learn the same thing over and over again, when it is the identical thing merely served under a different form. The scope of the book is so great, ranging, as it does from the simple lever to the complexities of steam and gas engines, that it cannot go very deeply into the exposition of principles and the means employed to utilize them in practical work. Its value, therefore, consists in its suggestiveness by which a principle or method is stated and the student left to work out or investigate the details for himself; enough is, however, given for a start in the right direction and with this the excuse for going astray will be a poor one.

The first part covering 111 pages is devoted to these elements of mechanism. The second part of 143 pages is devoted to the steam engine, and the third, the remainder of the book, to the pump, gas engine, water power and compressed air. In treating these mechanisms the bare outline of their construction and principle of operation are given, for, as it is stated in the preface, "it is not intended that the subjects treated should be regarded by the student as exhausted, but rather as containing guiding principles for more thorough investigation," and this has been successfully accomplished. If the student or the reader has received a certain amount of grounding in mechanics and has an understanding in outline of the details of mechanisms ordinarily employed, the book will serve as an excellent guide for further and more exhaustive study.

Concrete Construction, Methods and Cost. By Halbert P. Gillette and Charles S. Hill. New York and Chicago: The Myron C. Clark Publishing Company. 690 pages, 6 x 9 in.; 311 illustrations. Cloth. Price, $5.

This book treats of the cost of various types of concrete construction and the methods to be followed in the same. It has little or nothing to do with the calculations that must be made regarding stresses and strains and the disposition of the material in order to best meet the conditions imposed. It deals rather with the problems to be faced by the contractor in getting the material in place. It is therefore, essentially empirical in its contents and may be described as a collection of data regarding work that has been done, taken from a multitude of sources, such as the engineering journals, the transactions of engineering societies, government reports and the personal records of the authors and other engineers and contractors. Hence, it will probably be found to be of particular assistance to the contractor and engineer engaged in the actual work of placing concrete, although its value to the designer and architect should not be underestimated because it will serve as a guide to indicate the best lines to follow in order to obtain the greatest economy in construction.

The whole subject of the making and placing of concrete is treated with great elaborateness, starting from the principle of filling the voids of the aggregate through the economic methods of hand and machine mixing, the placing of the molds, the placing of the material and its care during the processes of setting and hardening.

Time and again the lesson of the saving of labor is driven home and it is shown by repeated instances how the carrying of the mixed concrete or the materials a few paces only on shovels, will make a considerable increase in the cost of the structure, and that the secret of economic work frequently depends, in the case of machine mixing, in such a distribution of the stock piles that haulage from such piles to the mixer is practically eliminated.

Especial attention is also paid, throughout the book, to the forms used that they may not only serve for the economical placing of the concrete and thus meet the requirements of the finished structure, but be so designed that they can be easily erected, removed and re-erected where a repetition of shape is to be made. In this suggestions for all of the details are made and the illustrations are numerous and clear upon these points.

The work is divided into chapters dealing with various types of concrete structures and foundations, such as piles, piers, fortifications, locks, dams, breakwaters, retaining walls, pavement, tunnel and subway lining, bridges, culverts, buildings, sewers, tanks and ornamental work with a closing chapter on waterproofing. In each case there is a thorough discussion of all of the elements entering into the work, with numerous illustrations of what has already been done; so that there is hardly a conceivable line of concrete work in regard to which the book has not some useful and practical suggestion to offer in detail in addition to the generalizations arising from the consideration of the subject as a whole.

Letters to the Editor.

GOVERNMENT-OWNED RAILWAYS IN ARGENTINA.

Buenos Ayres, Argentina, October 18, 1908.

To the Editor of the Railroad Age Gazette:

In your issue of Sept. 18th, in an article entitled "The Relation of Railroads to the State," appear the following words: "In South America, Peru and Argentina own, as far as I am aware, no railways."

If the author of the article had taken better pains to inform himself on these countries of the Far South, so undeservedly poorly known, he would know that the Argentine government is the proprietor of three railroads, as follows:

Northern Central (one meter gage) 1,985 kilometers (1,233 miles) in operation and 196 building, reaching to the Bolivian frontier.

Northern Argentinian (one meter gage), 760 kilometers (472 miles) in operation and 580 building.

Andino (1.676 meter gage) 482 kilometers (300 miles).

The branch lines from Embarcacion to Formosa, 700 kilometers (435 miles), and from Barranqueras to Metan, 850 kilometers (528 miles), both belonging to the Northern Central Railway, have already been mapped out and work on these will soon begin. They have also begun to build 2,000 kilometers (1,243 miles) of track in Patagonia. All this work is being done by the government.

R. Gutierrez, M.E.

WELDING LOCOMOTIVE FRAMES.

To the Editor of the Railroad Age Gazette:

Under the caption, "Frame Failures" there appeared a very interesting article in the December 4th issue of the *Railroad Age Gazette*, by C. G. Rommel, Inspector of the Baltimore & Ohio. This article dealt more especially with the welding of locomotive frames by the oil process, of which the author apparently had a rather poor opinion, as he states:

"At the best, this process is but a brazing one and cannot be as strong as a weld made under the steam hammer; still it is satisfactory from the fact that the locomotive may be kept in service. Often the brazing takes place on the outer edges only and in a few days the frame will be broken again."

The reason for writing this letter is that Mr. Rommel seems to class the Thermit process of welding with the oil welding process, as he states further:

"In order to prevent a repetition of failures, it would be well, when a locomotive with a frame which has been repaired by the oil burner or Thermit process goes through the shop for classified repairs, to take the frame down, send it to the smith shop to have the re-welded part cut out and a new section welded in."

From the experience of other railway companies it would

seem that this latter paragraph, as regards the Thermit process, is entirely unnecessary, and the writer would like to quote from a report read by G. W. Kelly, Foreman of the Central Railroad of New Jersey, before the International Railroad Blacksmiths' Association last August:

"We have followed this (the Thermit) process in making repairs of locomotives since February, 1905. Our experience thus far is that repairs are permanent. We have in service at the present time 224 Thermit welds." Speaking of a particular type of frame, Mr. Kelly goes on to say:

"We now have eight continuous frame sections in service, same as shown on page 103 of last year's proceedings, making 56 welds—no failures."

At the same meeting, John McNally of the Chicago & North-Western, made the following remarks regarding welding frames with Thermit:

"At the present time we are not doing much frame work of any kind in our blacksmith shop, as most of our frame work is being done in our erecting shop and roundhouse with Thermit and oil. All breaks in heavy sections of frame and breaks especially between the jaw are welded with Thermit. This work is not under my supervision, but is taken care of by the erecting shop people. At the present time they are using at this work one handy man and two laborers and the results obtained are remarkable. They have made, during the past year, 26 welds, with no failures up to date, which seems to me quite a record for Thermit."

It may be asked just why, with the above facts to show the permanency of Thermit welds on locomotive frames, there should ever be any failures of these welds. The answer is that Thermit welding requires close attention to minute details. In the hands of a careful and conscientious operator perfect results will be assured, while in the hands of a careless operator it is possible that certain steps in the making of the mold or the preheating of the sections will be ignored, and a failure results. Unfortunately the operator is never the one to get the blame and everything is charged against the process. An illustration of this occurred recently, when it was learned that a certain railway company had made a Thermit weld on a locomotive frame which subsequently proved defective. In reply to a note from the manufacturers, offering to place a mechanic at the railway's disposal free of charge to observe the next welding operation and see that the work was done properly, the Superintendent of Motive Power stated that the work which had given trouble had been done in accordance with the manufacturer's instructions and he did not see why it was necessary for them to send a representative to his shops to witness any welds that he might have made in the future. This matter, however, was followed up and at the next weld which the railway company made a representative of the manufacturers was present. He found that instead of the instructions being followed, practically everything was done wrong and that the mold was made with only 1 in. of sand around the weld—a most dangerous proceeding, as the very intense heat of the Thermit steel is apt to break through such a thin layer of sand and the entire contents of the mold will run out.

The case was very clearly put by one of the representatives of the manufacturers in a letter received some time ago. He says:

"Men who go into the railway shops should fully realize the importance of being thorough and patient in instructing, and see that they equip themselves with the necessary appliances, so they can handle the work successfully, for it is a great deal easier for us to have them get things up right than it is after we have left.

"The only difficulty in making roads good customers is to approve of the methods they have followed. One must get right down and do the work; impress on them the importance of preheating, making due allowance for shrinkages; know how to expand and when to let up; how to rig up to do difficult welds; also to lead, work hard and make them work hard.

"Also impress the importance of metallic manganese, not ferro, because they are liable to use too much and not get it mixed well, and when they try to machine the weld, claim they cannot cut it.

"Also impress the importance of a mold being well rammed up and the crucible set properly before the heat is applied, as much time is saved by so doing, resulting in very little loss of heat after the torch is shut off.

"The impression seems to have got around that all you have to do to weld Thermit is to sprinkle a little on the fracture and to set it on fire, and the question is always asked if something else would not do as well. This applies to fire clay, crucible linings, thimbles, wax (would not pin grease do just as well for patterns?), plugging material, oil for heating instead of gasolene, etc., so you see, the tendency is to lay a foundation for a failure, and then they wonder why they are not successful. None of this, of course, is done with vicious motives, but—'would it not do just as well?'"

It seems to me that the only fair way to determine the relative advantages of the various methods of welding is to do as Mr. Rommel suggests, i.e., to stamp the frame at the point of weld with a stencil denoting the date of making the weld and a mark to show whether the weld was made with Thermit or oil. If the blacksmith foremen are conscientious, the writer has no doubt that the Thermit welds will not only show up considerably better than those made with oil, but will compare in every respect with those made under the steam hammer. The reason for this opinion is that the Thermit process leaves a reinforcement around the weld, which considerably increases the cross section of the frame at the point where weakness has been proved. This makes the frame stronger than ever at that point and less likely to break again under the same strains that caused the first break.

An idea of the extent to which the Thermit process is used for frame welding may be gained from the fact that sufficient Thermit was sold to railways in North America during the first nine months of the year 1908 to weld 1,200 frames, an increase of 10 per cent. over the entire sales to railways in 1907.

GOLDSCHMIDT THERMIT CO.,
per W. B. Hulbert.

THE ECONOMICS OF GRADE REVISION.

Richmond, Va., Nov. 21, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

In my letter of August 13, which appeared in your issue of August 21, I called attention to the fact that according to the statistics of the Interstate Commerce Commission only 37.726 per cent. of total operating expenses were included in "Cost of Movement."

Passenger train mileage in 1906 was 43.32 per cent. of the total revenue train mileage, and assuming that it cost twice as much per mile to run freight trains, as it did to run passenger trains, the cost of moving freight was only 27.29 per cent. of total operating expenses, in which case a decrease of one-third in the mileage of freight trains, by increasing train loads, would reduce the total operating expenses 9.10 per cent.

ASSISTANCE FROM GRAVITY.

Ruling grades may be so light that the force of gravity cannot be utilized to any appreciable extent in descending them, and on the other hand they may be so heavy that the excess of gravity power must be neutralized by brakes. Neither of these conditions is as favorable to economy in power as where the grades are such that the force of gravity is just enough to maintain the required speed; but, of course, such ideal conditions cannot be realized in practice. In the early days of railroad building, engineers calculated on utilizing all the force of gravity to save steam power on descending grades, provided they did not exceed 21 feet per mile; but grades of

more than 21 feet per mile are necessary to maintain the higher speeds at which trains are now run, as will be seen from the following statement:

The economic advantage of assistance from gravity is in the saving of fuel and the water evaporated to make steam power, which depends largely upon the care and skill of the fireman; and it is claimed by some that the actual saving in fuel on descending grades is from 25 to 50 per cent. of what it would be if all of the assistance from gravity, not neutralized by brakes, could be used effectively. On the very low rates of descent the saving in fuel is inappreciable.

RATES OF DESCENT

Necessary to Maintain Different Speeds.

Speed.	Resistance per ton.	Grade.
20 miles per hour	8.326 lbs.	21.98 ft. per mile
25 " "	9.634 "	25.43 " "
30 " "	11.233 "	29.65 " "
35 " "	13.122 "	34.64 " "
40 " "	15.302 "	40.40 " "
45 " "	17.773 "	46.92 " "
50 " "	20.535 "	54.21 " "

NOTE.—For each degree of curvature per mile add 0.025 to the above grades.

AN ILLUSTRATION.

It has been suggested by a railway man of long experience that I supplement my letter of August 13 with an illustration that can be easily followed and fully understood by all of your readers.

The case proposed for an illustration is one in which an alternate line of 22⅓ miles was built and will be hereafter double-tracked for other important reasons besides economy of operation, and the question to be answered here is, "what proportion of the expenditure incurred in building the new line was justified by the immediate saving in the cost of operating it with through freight trains one way (in the direction of the heavier traffic) while all other trains continued to use the old line?" but our comparison of the two lines will be made with reference to their characteristics in both directions:

CHARACTERISTICS OF THE TWO LINES.

The characteristics of the two lines necessary for our purpose are as follows:

Going east:	Old line.	New line.
Miles of descent 0.2 per cent. and under	2.91	5.98
" " 0.2 " to 0.4 per cent.	1.71	0.75
" " 0.4 " to 0.6 per cent.	1.72	0.08
" " 0.6 " and over	6.55	4.87
Total	12.89	11.68
Going west:	Old line.	New line.
Miles of descent 0.2 per cent. and under	0.12	None
" " 0.2 " to 0.4 per cent.	0.68	4.77
" " 0.4 " to 0.6 per cent.	1.30	4.31
" " 0.6 " and over	8.50	None
Total	10.60	9.08
Miles of grades in both directions	23.49	20.76
Miles of level track	1.11	1.57
Total miles of track	24.60	22.33
Sum of ascents going east, in feet	398	188
Sum of ascents going west, in feet	426	216
Average curvature per mile, in degrees	123.41	50.56
Maximum grade going east, per cent	1.08	0.50
Maximum grade going west, per cent	1.12	0.70

TRAIN RESISTANCES.

The train resistance due to *friction* is usually computed at 6 pounds per ton, to overcome which it requires 31,680 foot pounds per gross ton per mile.

The train resistance due to *speed* is generally considered to be as the square of the speed divided by 172, which at twenty miles per hour is 2.326 pounds per ton, to overcome which it requires 12,281 foot pounds per gross ton per mile.

The train resistance due to *curvature* is as nearly as ascertained, 0.5 pounds per ton for each degree of deflection per 100 feet, to overcome which it requires 50 foot pounds per gross ton per mile for each degree of curvature per mile.

The train resistance due to *gravity* is at the rate of 2,000 foot pounds per gross ton for each foot of elevation overcome, and is more or less per gross ton per mile in proportion to the number of feet of ascent per mile; therefore the *train resistance* per ton due to gravity is 2,000 times the ascent per mile divided by 5,280. This is useful only in determining what the locomotive will pull at different rates of ascent, and will not be considered except in our computation of engine mileage.

As an offset to the power necessary to overcome these resistances, we have so much of the force of gravity on descending grades as can be availed of to move trains, but as has already been stated, the saving in fuel and water is not in proportion to the saving in power on descending grades; and it will simplify our calculations if we consider the saving in steam power by assistance from gravity to be in proportion to the estimated saving in fuel and water.

The following proportions of fuel actually saved are estimated in percentages of the fuel required on straight and level track, and can be changed to meet the views of others whose practical experience justifies different conclusions:

On grades of 0.2 per cent. and less	Same as level track
" " 0.2 " to 0.4 per cent.	25 per cent.
" " 0.4 " to 0.6 per cent.	50 "
" " 0.6 " and over	75 "

POWER REQUIRED PER GROSS TON.

The power required to move one gross ton over each of the two lines eastward and westward can be ascertained by the following formula:

E = Sum of ascents;
D = Miles of ascents;
M = " level track;
G = " descents of 0.2 per cent. and less;
H = " " 0.2 " to 0.4 per cent.;
I = " " 0.4 " to 0.6 per cent.;
K = " " 0.6 " and over;
F = Resistance from friction
S = " " speed } In ft.-lbs. per ton per mile;
C = " " curvature
P = Power per gross ton-mile;

$$P = 2{,}000E + (D + M + G + 0.75H + 0.5\ I + 0.25K)\ x\ (F + S + C).$$

The values of the quantities represented by letters are as follows, for each of the two lines going east and going west, respectively:

	Old line—Going east.	Old line—Going west.	New line—Going east.	New line—Going west.
E	398 ft.	426 ft.	188 ft.	216 ft.
D	10.60 miles	12.89 miles	9.08 miles	11.68 miles
M	1.11 "	1.11 "	1.57 "	1.57 "
G	2.91 "	0.12 "	5.98 "	0.00 "
H	1.71 "	0.68 "	0.75 "	4.77 "
I	1.72 "	1.30 "	0.08 "	4.31 "
K	6.55 "	8.50 "	4.87 "	0.00 "
F	31,680 ft.-lbs.	31,680 ft.-lbs.	31,680 ft.-lbs.	31,680 ft.-lbs.
S	12,281 "	12,281 "	12,281 "	12,281 "
C	6,170 "	6,170 "	2,528 "	2,528 "

Substituting these values for the letters in the above formula, we ascertain the power required per gross ton for each of the two lines, going east and going west, respectively, as follows:

	Going east.	Going west.
	Ft.-lbs.	
Old line, per gross ton	1,718,410	1,824,530
New line, per gross ton	1,233,722	1,314,477
Saving	484,688	510,053

GROSS TONNAGE.

We have ascertained the saving in power per gross ton going east and going west, but the estimated saving in power going west cannot be availed of until the westbound through trains are transferred to the new line. The next question is the total saving in power per annum, as the new line is now operated, to determine which we should know the number of gross tons of locomotives, cars and loads going east which have been transferred from the old to the new line. No actual account of this has been kept for one year, but it has been pretty closely estimated from statistics for a shorter period, as follows:

	Going east.
Tons of freight (or paying load)	5,562,600
Tons of cars	3,267,480
Tons of locomotives	1,133,690
Total gross tons	9,963,770

SAVING IN POWER PER ANNUM.

Multiplying the above number of gross tons by the number of foot pounds of power saved per ton, we have for the total saving per annum, 9,963,770 × 484,688 = 4,829,319,753,760 foot pounds.

If, as is believed, one pound of coal, as usually consumed in

the firebox of a locomotive, produces 350,000 foot pounds of power applicable to the movement of trains, one ton of coal produces 700,000,000 foot pounds; and the saving in power as above is equivalent to a saving of 6,899 tons of coal.

The cost of fuel and water on the locomotive was $1.08 per ton of coal, making an annual saving in money of $7,450.92.

ENGINE MILEAGE.

So far we have considered only the relative power required to operate the two lines without reference to the number of trains required to move the tonnage, which depends upon the average number of tons of paying load per train.

The number of train loads required to move a given amount of tonnage over a given length of road, say at twenty miles per hour, depends upon the number of gross tons one locomotive can move over it at the required speed; and the capacity of a locomotive is limited by the train resistances *per ton*, which have been heretofore explained, but the following table will show what they are in pounds per ton at different speeds on the maximum grades (equated for curvature) encountered on the two lines in question. For our present purpose we, of course, need only those going east, for the reduction in train resistances going west cannot be made available so long as all westbound trains use the old line.

	Maximum grade.	Speed in miles per hour				
Going east:	per cent.	20	25	30	35	40
Old line	1.08	49.24	50.54	52.14	54.03	56.21
New line	0.50	27.27	28.57	30.17	32.06	34.24
Rel. weight of trains, per cent.		80.60	76.90	72.82	68.52	64.16
Going west:						
Old line	1.12	50.75	52.06	53.66	55.55	57.73
New line	0.70	35.98	37.28	38.88	40.77	42.95
Rel. weight of trains, per cent.		41.05	39.65	38.04	36.25	34.41

NOTE.—The figures designated as "Relative Weight of Trains" are percentages of increase in the weight of trains made practicable by the reduction in maximum grades on the new line.

If one locomotive can haul at twenty miles per hour going east over the new line 80.60 per. cent. more gross tons than it can haul over the old line, 55.38 maximum trains would move as much over the new line as 100 maximum trains would move over the old line in the direction of the heavier traffic, and taking into account the relative lengths of the two lines, 1,237 engine miles over the new line would be equivalent in efficiency to 2,640 engine miles over the old line.

We must bear in mind, however, that the maximum weight of through trains is controlled by the ruling grades on a division, and cannot be readjusted for intermediate distances to avail of more favorable conditions on any part of a division. On the other hand, however, helping engines can be used to overcome exceptional grades for short distances; and this was done on the old line, keeping four helping engines employed, which together made 176 engine miles per day at a cost of 32.4 cents per mile, or $20,812 per annum.

ANSWER TO QUESTION SUBMITTED.

We have ascertained that by reason of lower grades and lower elevations it requires less power per ton to operate the new line, and that by reason chiefly of a reduction in the rates of ascent it requires less engine mileage to move the same volume of tonnage over it; and that these two savings made a reduction in operating expenses of $28,262.92 per annum, which would pay interest at 5 per cent. on $565,258.40. The expenditure therefore of that amount was fully justified by an immediate saving in the cost of operation, and this is the answer to the question submitted; but this saving was not the only, or perhaps the most important, reason for building the new line, for a second track and more yard room were needed to relieve congestion and the delays incident thereto, which added to the cost of operation even more than the gradients on the old line. These and similar questions may have to be considered in any proposed changes of alinement and grades; but whatever the importance of them may be, they are not within the limits of this discussion.

T. M. R. TALCOTT,
General Manager, Tidewater & Western Railroad.

Contributed Papers.

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

VI.

For many years before the development of the single-phase commutator motor (which makes possible the single-phase over-head wire system), electrical engineers had been looking for a system which would allow of high-tension current being distributed to the trains by a single overhead wire, chiefly because it was realized that for distances of 100 miles or over the energy could, with such a system using the track as a return circuit, be distributed to the trains with reasonable first cost and efficiency. If, for example, the important and heavy main-line traffic between such places as Hamburg and Berlin or New York and Buffalo is ever to be handled electrically, the comparative infrequency§ of the train service compared with that on a suburban system, and the long distance over which the current has to be conveyed, render some such system desirable, and there is no doubt that for such lines the single-phase system to-day shows advantages over any direct-current system, especially in first cost. It was also hoped that in countries whose fuel is dear and cheap water power is available, such as Italy, Sweden and certain parts of America, this system would render electrical operation of main-line road feasible, even where there was a still less frequent service.

I called attention at the beginning of this report to the importance, in the case of the Victorian State Railways, of the suburban business. This fact has a direct bearing on the question as to which is the most suitable system of electrical operation to adopt for dealing with this traffic because, even if it were necessary or desirable to consider at the present time the operation of the main or country lines electrically, it would not be right to sacrifice the efficiency or reliability of electrical operation on the important suburban system to the comparatively infrequent service on the country lines. This point does not arise, however, because the train service at present required on the country lines in Victoria, and likely to be required in the future, would not warrant the operation of any of these lines electrically by any system, and therefore the choice of a system for the suburban work need not be influenced by any such consideration. We are, therefore, free, in the case of Melbourne, at any rate, as distinct possibly from places where the suburban lines run in conjunction with main lines on which there is a more frequent service, to consider the interests of the suburban system alone.

It has been claimed that even for such suburban lines on which there is a frequent service, the single-phase system shows very considerable advantage in first cost compared with the direct-current system. This, however, has not proved to be the case after working out in detail the cost of dealing with the Melbourne suburban traffic, for not only would the overhead lines be very much more costly than has frequently been stated to be the case, but the additional cost of the large number of train equipments required would practically balance the extra expenditure on the sub-stations required in the case of the direct-current system:† in fact, the very complete investi-

*Abstract of the Report to the Victorian Railways Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

§ The less frequent the service the less important is the high first cost of single-phase train equipments because the cost of the train equipment forms a much smaller proportion of the total capital expenditure than on a system where a close headway of trains is a necessity.

†In such a comparison we must assume overhead transmission lines throughout for both schemes. Although overhead lines in the central area are objectionable, they are essential to the single-phase system, and, if their erection for this purpose be justified, we must assume them also in the case of the direct-current system instead of underground cables for the feeders to sub-stations.

gation which I have made into the first cost of providing the electrical equipment for the Melbourne suburban lines has confirmed the opinion as to the relative first cost of the two systems which I had formed in investigating similar problems for other suburban railways. In the case of Melbourne, it is only when we include very long and sparsely populated lines, such as the Frankston branch, to which in any case I should not consider the extension of electrical operation justifiable, that the single-phase system shows any appreciable saving in the cost over the direct-current system.

When, however, we come to consider the total annual cost (which is the important figure), including operating expenses and interest charges, it is found that under Melbourne conditions the direct-current system shows a saving compared with the single-phase system. It is, therefore, not possible to recommend the adoption of the single-phase system on financial grounds.

When it comes to a question of considering, apart from financial reasons, which is the more suitable system for dealing with the large suburban traffic which the Melbourne suburban lines have to cope with, a comparatively new system, such as the single-phase system, must obviously show some very decided advantages in operating facilities before it should be adopted in preference to the well-tried direct-current system, especially when it shows no advantage from a financial point of view. It must not be forgotten that the only line at all comparable with the Melbourne suburban system that is operating to-day on the single-phase system is the Hamburg-Altona line, and that this line has only been in regular operation since January of this year, and even yet can hardly be considered complete. There are also many cases in America where long distance interurban lines are operated on the single-phase system, but these are not comparable with the Melbourne system for complexity, as they mostly operate single coaches, not trains. The New Haven line outside New York also operates on this system, but at present only locomotives are in use.

As, therefore, I cannot recommend you to consider the single-phase system for financial reasons, and as I consider that the direct-current system is superior to it in a case such as that of the Melbourne suburban lines from an operating standpoint, I have decided, after having studied the whole problem in great detail and from all points of view, that the direct-current 800-volt protected conductor-rail system is the right one to adopt for Melbourne. I will briefly state my reasons for considering this the better system from an operating standpoint.

As a mechanical structure, a protected conductcr rail, compared with overhead wires, is superior in both simplicity and reliability; it not only needs less repair, but less inspection. Most important of all, the inspection and repair work can be done by the ordinary permanent-way staff in daylight and when the service is in full operation, whereas the inspection and repair of overhead wires requires a special staff, not only because it has to be done at night, but also on account of the class of labor required. This is obviously very important in a country where electrical operation has not hitherto been adopted and where labor is dear. When it is also considered that the wear on the conductor rail is practically negligible whereas the wear on the overhead wire is not inconsiderable, this point becomes still more important. While overhead wires may be in every way suited to long lines on which the service is not so frequent and where there is consequently less wear and tear and where, also, there may be time between trains to inspect and to do repair work, the protected conductor rail, which needs less inspection and can be, and is, inspected at any time by the ordinary permanent-way men, offers a more reliable service on a busy suburban system.

It would obviously, in the case of overhead wires, be impossible to carry out repairs on a system such as the Melbourne suburban system except at night, firstly because for any detailed inspection a tower wagon is required, for which the exclusive use of the track is necessary, and, secondly, because in case of any repairs being necessary to the overhead wires, the power must on account of the high voltage employed, be completely cut off. It would be a serious matter and would cause great inconvenience to the public if, owing to lack of inspection and consequent break-down of the overhead system, the traffic were dislocated on lines operating on from two to five minute headways. With a conductor rail, on the other hand, not only are break-downs requiring instant attention extremely rare but the repairs thereto are effected more easily and without interruption to the traffic.

The Melbourne system is particularly suitable for conductor rail operation on account of the dryness of the climate and the excellent condition of the ballast and track.

On a system where as many as 500 motors will be required, reliability of the train equipment is a matter of not less importance than the reliability of the conductor rail equipment itself. The single-phase motor equipment, such as would be required for the Melbourne service, is not only some 50 per cent. heavier than the direct-current equipment, but it is also very much more expensive on account of the greater complexity and weight of the motor and of the equipment as a whole. This necessarily means more costly repairs, apart altogether from the fact that the commutation of the single-phase motor is not as satisfactory as that of the modern direct-current motor. Obviously, other things being equal, the lighter the equipment the better, as the deadweight of the motor, which comes more or less directly on the axle, means increasd cost of repairs to both track and rolling stock.

To sum up, then, I am of opinion that the direct-current system will, in the present state of development of the different electric traction systems, give more satisfactory operation and, taking into account all interest charges and operation expenses, be cheaper than a single-phase system for such a service as has to be given by the Melbourne suburban lines. I have arrived at this conclusion, taking into account the fact that a considerable sum will have to be spent on altering the bridges in order satisfactorily to locate the conductor rail, but without allowing in the single-phase estimates for any possible alterations to telephone mains strung parallel to the railways.

The question of interference with the important telephone system of Melbourne, although not a matter which concerns the State so much as it does the Commonwealth Government, might have justified our taking into consideration—though this has not been done—the large extra expense which the installation of high tension overhead wires closely adjacent to the telephone wires would probably mean, not to mention the great public inconvenience of having the telephone service seriously interfered with even temporarily.

Having settled on direct current at 800 volts for distributing the energy to the moving trains it is necessary, in order to limit the losses in the conductor rail and track, to make arrangements for feeding them at various points on the system. This can be most conveniently arranged by generating and transmitting the energy as high-voltage three-phase alternating current, and converting it into direct current at substations spaced at suitable intervals, depending on the density of the load on the different lines.

There will be installed in the substations rotary converter sets consisting of three-phase stationary transformers, for transforming the current to a lower pressure, and rotary converters for converting the alternating current into direct current. These rotary converter sets are very economical and reliable pieces of apparatus capable of dealing with the large variations of load met with on a railway system of the magnitude of the Melbourne suburban railways. They also allow of the use of three-phase generators, the most suitable type of generator for coupling direct to steam turbines.

(To be continued.)

ARTICULATED COMPOUND LOCOMOTIVES.*

BY C. J. MELLIN.

The constantly increasing demand for heavier power, made by most railways in the country during the last decade, and especially by those roads having heavy gradients combined with sharp curves, brought out various designs which on account of rail pressure limitations required so many coupled wheels that the length of the rigid wheel base made them unwieldy to operate with efficiency. This demand for greater power was, of course greatest in mountain districts where heavy grades and sharp curvatures generally go together, necessitating for safe operation, comparatively short wheel bases, reduction in engine resistance and wear of wheel flanges and rail, together with moderate weight of the working parts of the engine.

In striving to meet this demand, the locomotive designers and builders were brought face to face with an unsurmountable barrier to further progress in the enlargement of engines on the old lines; and in 1902 the American Locomotive Company decided to work out a design of a heavy, powerful locomotive for the Baltimore & Ohio Railroad, having two sets of engines under one boiler, capable of adjusting themselves independently to the alinement of roads with curvatures up to 30 deg. on the principle developed by the prominent French engineer, M. Anatole Mallet, of Paris.

Mr. Loree, then President of the Baltimore & Ohio Railroad considered the question seriously; but it was first thought that it would be of no advantage to the Baltimore & Ohio Railroad, even if it proved successful, and the subject was left undecided for some time. In the latter part of 1903, on the recommendation of J. E. Muhlfeld, who in the meantime had become General Superintendent of Motive Power of the Baltimore & Ohio, ordered one engine of this type, which was built at the Schenectady Works of the American Locomotive Company during the winter of 1903 and 1904, to suit the conditions of that railway.

Propositions for building the Mallet type of engine had been made both by S. M. Vauclain, General Manager of the Baldwin Locomotive Works, and by the writer, several years prior to the above date, but the one under consideration is, so far as the writer is aware, the first engine of this type completely designed and built in the United States. The original Mallet type of engines built in Europe dates back to the early nineties, but its history would be too extended to embody in this paper.

This Baltimore & Ohio locomotive, which was of unusual dimensions for that time, was exhibited at the Louisiana Purchase Exposition at St. Louis in 1904. A great number of locomotives of this type, of various sizes, have since been built for other roads as forerunners of what promises to be the most powerful and efficient type of the freight engine of the future. The form permits of the application of cylinders of largest dimensions, as well as of the largest boiler capacity, by the distribution of the weight over a long wheel base and over many driving axles. Up to the present date a tractive power of about 125,000 lbs. has been reached, whereas the ordinary types of engines rarely exceed 44,000 lbs.

The tractive power P is figured by the usual formula for multiple expansion engines working compound, namely:

$$P = \frac{d_L^2\, p\, C\, s}{D}$$

in which d_L = Diameter low-pressure cylinder.
p = Boiler pressure.
s = Stroke of piston.
D = Diameter driving wheels.
C = Coefficient obtained from actual practice, and varying with the degree of cut-off and cylinder ratio.

The cylinder ratio being as a rule 1 to 2½, and the cut-off in the high-pressure cylinder about 82 per cent. the value of coefficent C is about 0.53 at a piston speed not exceeding 250 ft. per minute.

For working single expansion, the formula will be that of a simple engine multiplied by 2 or

$$P^1 = \frac{2\, d^2\, p\, C\, s}{D}$$

where the symbols are the same, except d, which represents the diameter of the high-pressure cylinder, and the value of C equals 0.85, which is accepted for simple engines.

The factor 2 is used on the basis that the low-pressure engine develops the same power as the high-pressure, because the steam supply to the former is reduced in an inverse proportion to the cylinder ratio.

Table 1.—Comparison of Principal Dimensions and Weights of Individual Parts of Heaviest Mallet Engine and Heaviest Designs of Ordinary Types.

Road.	Erie.	D. & H.	P. B. & L.E.	A. T. & S. F.	A. T. & S. F.	B.R.& P.
Builder	A.L.Co.	A.L.Co.	A.L.Co.	A.L.Co.	Baldwin	A.L.Co.
Type	Artcltd. 0880	Consol. 280	Consol. 280	Decpd. 2100	Decpd. 2100	Decpd. 2100
Simple or comp. cyls.	Comp.[1]	Simple	Simple	Comp.[2]	Comp.[2]	Simple
Diam. & stroke, in.	25 & 39 x 28	23 x 30	24 x 32	17½ & 30 x 34	19 & 32 x 32	24 x 28
Boiler pressure, lb.	215	210	210	225	210	210
Diam. dvg. whls., in.	51	57	54	57	57	52
Tractive power, lb.	94,800	49,690	60,900	55,300	62,500*	55,350
T. P. work'g simple	120,000	....	....	63,000	64,100	....
Total weight	410,000	246,500	250,500	259,800	266,500	268,000
Wgt. on drvrs., lb.	410,000	217,500	225,500	232,000	237,000	243,000
Factor of adhesion.	4.33	4.38	3.7	4.20	3.82	4.39
Rigid wheel base	14′ 3″	17′	15′ 7″	20′	20′ 4″	19′
Average load per wheel on rail, lb.	25,625	27,200	28,200	23,200	23,700	24,300
Weight—						
Main rod, lb.	968	985	1,144	817	1,028	1,050
Inter. rod, lb.	406	681	424	574	....	449
Front rod, lb.	133	188	260	158	....	187
Back rod, lb.	135	208	200	158	....	190
Back inter. rod, lb.	....	....	....	244	....	190
H.p. piston and rod, lb.	790	782	693	1,130	1,075	830
L.p. piston and rod, lb.	993	....	....	1,130	1,075	....

[1] 4 cyl. articulated.
[2] 4 cyl. tandem.
* Calculated by the formula used by the Baldwin Locomotive Works for figuring the tractive power of 4-cylinder tandem compound locomotives.

The Mallet articulated arrangement presents the advantage of making it possible at the very first to provide an engine under the control and operation of a single crew, having double the power of the largest engines of the ordinary type.

These advantages are most clearly evidenced by the comparisons in Table 1 between the heaviest engine of the Mallet type ever built and some of the heaviest freight engines of standard types.

The comparison in Table 2, however, between one of the lighter designs of Mallet engines and a few engines of the ordinary types, of approximately the same power, clearly shows that the same tractive power is obtained with this type as in other types, but with weights of moving and wearing parts equivalent to those of an engine of half the tractive power.

Table 2.—Comparison of Principal Dimensions and Weights of Individual Parts of Mallet Engine and Designs of Ordinary Types of Freight Engines Having Approximately Similar Tractive Power.

Road.	Central Ry. of Brazil.	N. Y. C. Lines.	Erie.
Builder	A. L. Co.	A. L. Co.	A. L. Co.
Type	Articltd. 0660	Consol. 280	Consol. 280
Simple or compound	Compound*	Simple	Simple
Cylinders diam. & stroke, in.	17½, 28 x 26	23 x 32	22 x 32
Boiler pressure, lb.	200	200	200
Diameter of driving wheels, in.	50	63	62
Tractive power, lb.	42,420	45,700	42,500
Trac. power work'g simple, lb.	52,000	....	....
Weight on drivers, lb.	206,000	208,000	179,000
Total weight, lb.	206,000	234,000	202,000
Factor of adhesion.	4.85	4.5	4.2
Rigid wheel base	9′	17′ 6″	17′
Avg. load per wheel on rail, lb.	17,166	26,000	22,375
Weight of main rod, lb.	417	821	848
" inter. rod, lb.	....	403	509
" front rod, lb.	208	185	246
" back rod, lb.	92	201	210
Wgt. of h.p. piston and rod, lb.	297	664	516
Wgt. of l.p. piston and rod, lb.	459	....	....

* 4 cyl. articulated.

In general, the Mallet articulated locomotive consists of a

* Presented at the New York meeting (December, 1908) of the American Society of Mechanical Engineers.

front system with its frame work, low-pressure cylinders with their attachment of guides and rods, one set of driving wheels, cross-ties and boiler supports; and a rear system with the high-pressure cylinders and frame work, fixed to the boiler as though an ordinary engine were placed under the rear part of the boiler.

The supporting points are of course in the center of their respective wheel bases; and are preferably used as the reference centers for calculating the moments of the individual systems.

It will be seen from Fig. 1 that, when the proper weights have been arrived at as a whole, the weight of each system with its center of gravity must be figured out independently, starting with the front system in which the center of gravity falls well ahead of its center of support. As the rear system is by far the heavier, the front system must therefore carry one-half of the difference between the two to divide the weight equally. The point where this weight is to be supported on the front system is readily located by finding the required lever arm to obtain the same moments in the rear of the center of the wheel base as those in front of it. This center may be called the virtual supporting point of the rear system on the front engine.

The weight on this point, multiplied by its distance from the center of the wheel base of the rear system, gives the moment for this system. By dividing the weight of the rear system into this moment, we find the distance from the wheel base center of that system at which its center of gravity must be located; as is graphically shown, with all moment curves in both systems, in Fig. 1. The balls in the figure represent the various weights so far as they effect the distribution, and their relative value is represented by their height from the base line. It is not necessary to include wheels, axles and boxes or what are termed dead weight in this method of calculation, because they are all central over the supporting points; and, as shown in the figure, are added after the distribution of the live weight is ascertained. In Fig. 1, the curve to the right of the front wheel base center is the moment curve of that system. This curve is reproduced on the left of the center and will pass through the point where one-half of the distance between the two systems will balance that of the front system. Starting from this point, and with reference to the rear wheel base center, we get the moment curve for the rear system which passes through the center of gravity of that system where it intersects the level from the common base line, representing its total weight. All the moment curves are, of course, true hyperbolæ and are therefore easy to construct. An approximate plan is laid out and modified until the desired total weight is obtained; and, if the center of gravity of the rear system does not coincide with this calculation of distribution, it is generally most convenient to shift the location of the boiler in the required direction until that occurs; or, if preferred, the framing and heavier castings in front and rear of the center of gravity may be modified to produce the same effect.

The support of the rear system on the front engine, shown in Fig. 2, must be capable of sliding laterally to allow the front engine to enter a curve and form an angle with the rear engine. For this reason the two engines are hinged together by vertical swivel pins located, preferably, slightly ahead of a point midway between the two wheel sets, because the swivel point being so located aids the guiding of the rear engine into curves on account of its closer proximity to the center line of the track when the engine is going ahead. A lateral spring applied in the front part of the leading engine permits an elastic yielding of that engine into a curve and restores alinement in leaving it (Fig. 3).

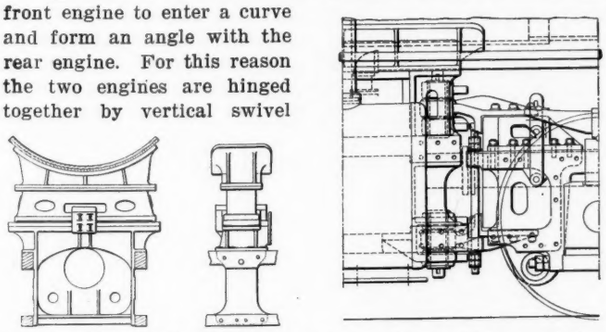


Fig. 2—Main Boiler Bearing. Fig. 4—Verical Hanger Bolts.

It is not practical, however, to place the sliding support on the virtual location previously mentioned; because the front engine would then be unstable and tip one way or the other, like a scale beam, with the slightest disturbance due to change of weight on grades, but it should be on a convenient location in front of the virtual one. This, of course, would allow the front engine to tip forward as the imposed weight on that point would be less and the arm from the driving wheel base center, shorter. To correct this disturbance, a pair of vertical hanger bolts are applied between the upper member of the frame at the extreme rear end of the front engine and the lower member at the extreme front end of the rear frame (Fig. 4); or two supports may be provided, one on each side of the virtual supporting point. With these bolts or hangers,

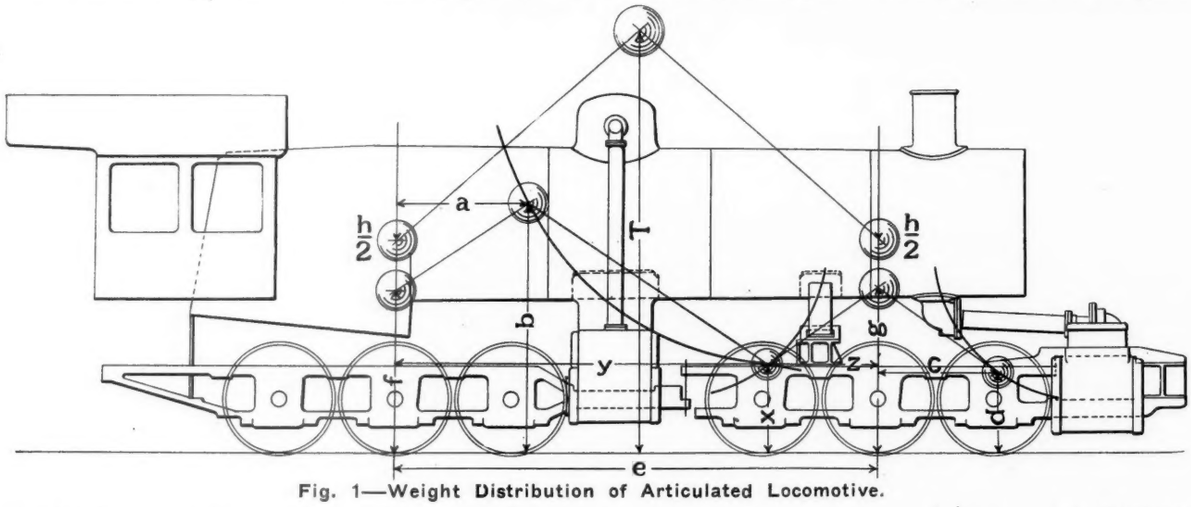


Fig. 1—Weight Distribution of Articulated Locomotive.

$a \times b = y \times x \qquad c \times d = z \times x \qquad (a \times b) + (c \times d) = e \times x \qquad f = b - x \qquad f = g \qquad x = d \qquad g = d + x \qquad h = \text{dead weights}$

$$x = \frac{(a \times b) + (c \times d)}{e}$$

$$f + \frac{h}{2} + g + \frac{h}{2} = T$$

the proper alinement of the front engine may be adjusted at will and the effect of the combined supports is restored to the virtual supporting point. This method reduces the pressure on the sliding plate and imposes load on the bolts in proportion to the respective distances of the two supports from the virtual supporting center.

It is evident that the supporting bearing must be self adjusting to bear evenly at all alinements of the engine. To accomplish this, the lower, or what we may call the pillow plate, has a ground surface on its upper side on which a corresponding upper plate can slide with the movement of

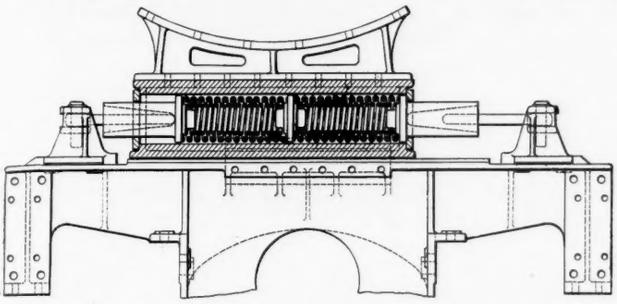


Fig. 3—Spring Centering Device.

the boiler; while its under side is slightly curved to allow a longitudinal rocking. This pillow plate is held in position by means of two dowel pins of about 2 in. in diameter recessed about ¾ in. into the plate and an equal amount down into the cross-tie on which it rests approximately in the middle of the convex or curved part. In this way the pillow plate is kept in position without destroying its ability to adjust itself so as to present a uniform bearing for the upper or sliding plate at any alinement of the engine, Fig. 2.

The front engine thus becomes a very efficient leading truck for the rear engine. Opinions on the use of a truck in the articulated engine are, however, divided; but, because of the many objections connected with the application of a front truck in freight service as to the first cost, maintenance, dead weight and unfavorable distribution of the machinery sometimes causing serious obstructions, nothing is gained by this

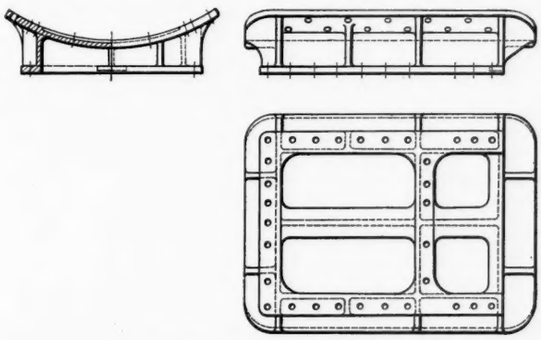


Fig. 5—Boiler Saddle.

objectionable feature; as it is practically the same as putting a truck ahead of a truck.

The front engine in going ahead being a truck in itself, the first pair of drivers have a leverage in their favor in entering the curve. The reason for this is that the virtual support of the weight of the rear system, which is carried by the front, falls back on the latter and in the rear of the sliding bearing, thus allowing a great part of the load of the rear engine to be carried by the hanger bolts (Fig. 4) between the two frames.

This alone reduces the pressure very materially on the sliding plate, which together with the short arm for friction resistance and long guiding arm for the flanges, reduces the pressure on them to a small fraction of the total friction load on the sliding plate; and comparatively light centering springs will therefore suffice for this purpose and still further reduce the flange pressure.

These same leverages and resistances act equally favorably in backing; as it is simply a reversed operation and the rear drivers have to swing the boiler against these resistances. Therefore, it is important that these should be small and with the shortest possible leverages, which naturally also minimizes the flange pressure on the rear wheel; that is, the last wheel of the engine, which then has to do the guiding.

With the use of a front truck, the center of support is shifted forward and with it the virtual and actual supporting points of the weight of the rear engine carried on the front system. The weight on this support must, therefore, be increased with the carrying capacity of the truck and offer little or no opportunity for transferring any of this load to the hanger bolts, practically doubling both the load on the sliding plate and the length of the resistance arm. At the same time, by the application of a front truck, the guiding point is moved forward so that the leverage has been increased to offset the increased side resistance of the engine.

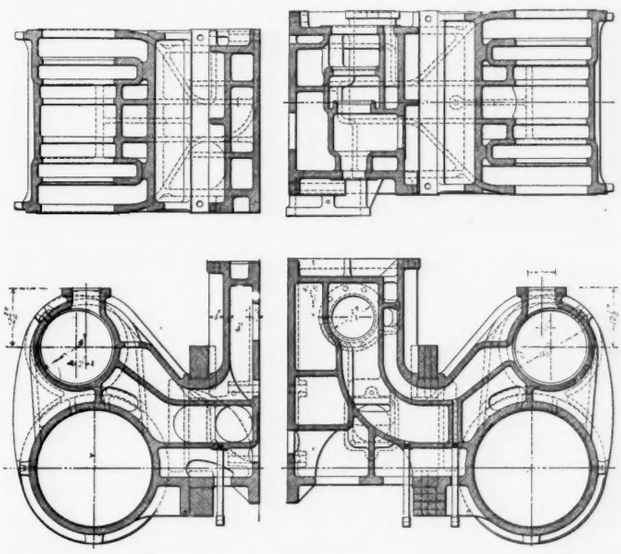


Fig. 6—Cross-Sections of Right and Left Hand High Pressure Cylinders.

The guiding power of the truck, however, is limited to its swing resistance. This, therefore, may leave as much or more guiding to be done by the front drivers as where no truck is used because of the increased moments of resistance of the engine in curving.

A more serious matter, however, is the backing with a front truck. The high resistance moments in the front must be overcome by the rear drivers, which are doing the guiding, and it is easy to understand how fast the flange pressure is multiplied by this displacement of the load and the safety margin for derailing dangerously reduced. It is therefore evident that a rear truck is a necessity when a front truck is used where backing is to be considered; thus curing one evil with another. Even with the application of a rear truck, the objections caused by the application of the front truck will be only partly compensated for; as the following very essential objections still remain:

a. The application of a front truck increases the distance of the front buffers from the first pair of drivers by 15 to 20 per cent., and consequently throws the front drawhead of the engine further out from the center of the track in curves than with the shorter extensions where no front truck is used.

b. It increases the total wheel base of the engine about 8 ft. 6 in., requiring an 80-ft. turntable to take an average sized engine with its tender.

c. Additional dead weight to be carried by the truck must be provided and the expenses in maintenance and first cost by the use of it are items that should not be overlooked.

d. The long arms for friction resistances on the sliding plate with increased load on them, due to the front truck, will not be lessened by the application of a rear truck.

e. When only a front truck is applied, the boiler is necessarily moved so far forward that it leaves scant room for the valve motion on the rear engine. The result of this is that the width of the firebox is necessarily limited to about 72 in.

In the case of passenger engines of the articulated type, however, large wheels would be used, and only four pairs of drivers can or need be applied. A four-wheel front truck, with rigid center pin and rigid trailing wheels, work in conveniently in the place of a third pair of drivers in each engine front and rear, respectively; which otherwise with their large diameter, make the engine unduly long.

Continuing with the construction of an engine without a truck, the spring rigging and equalization are next to be taken into consideration. The springs are most conveniently located above the boxes and frame, except under the firebox where they must be placed between the adjacent wheels with yokes over the boxes in the usual manner. On the front engine, all springs on each side are equalized together with a cross equalizer between the front springs. The rear engine is equalized in the same manner, except that the cross equalizer is omitted. This makes a three-point suspension of the whole engine and prevents any excessive local

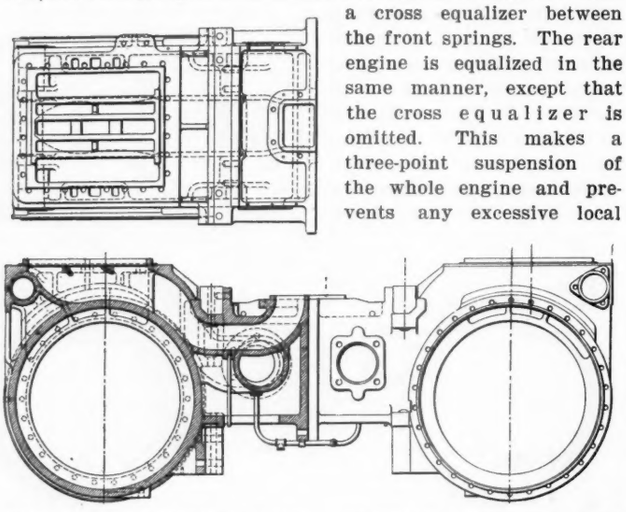


Fig. 7—Cross-Section, Front and Plan Views of Low Pressure Cylinders.

stresses of a diagonal nature on an uneven road; as the front engine accommodates itself very freely to the rear engine and approximately divides the angularity between the inclination of the axles. The wheels then follow the rail comparatively freely and easily on the twisting parts; at the rising of the outer rail, on entering and leaving curves, as well as on any other unevenness of the road.

The high-pressure cylinders, as previously stated, are located under the cylindrical part of the boiler, generally slightly in the rear of the middle of the barrel. They are provided with a cast steel saddle, bolted or riveted to the shell of the boiler by its upper flange and to the cylinder half saddle by its lower flange as shown in Fig. 5. The cylinder saddles, however, are not divided in the center of the engine; but sufficiently to one side to allow the receiver pipe with its ball joint to be placed in the center line of the engine (Fig. 6).

The low-pressure cylinders, Fig. 7, are fixed to the front engine with so-called "half saddles" but not connected to the boiler, except by the flexible exhaust pipe. With the large low-pressure cylinders required for the desired power, there will naturally be considerable suction of cold air through the cylinders in running with the steam shut off; which is very objectionable for several reasons, one of which is the sudden cooling of the cylinder walls and passages. To obviate this, a pair of by-pass valves (Fig. 8) are located in the cylinder castings. These valves automatically open communication between both ends of the cylinder when the throttle is closed, so that a certain amount of air can circulate through this passage to and fro with the movement of the piston, and

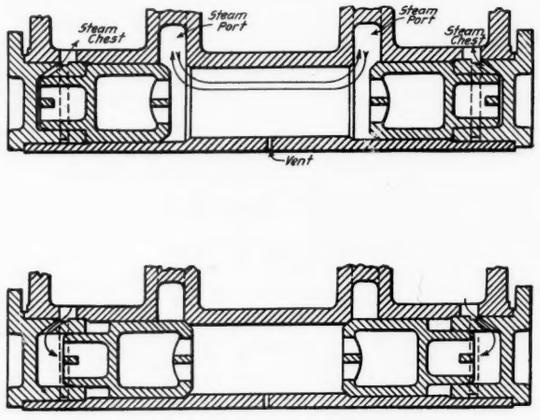


Fig. 8—By-Pass Valves.

thereby prevent the sudden changes in the temperature and relieve the pumping of air through the exhaust nozzle, and also minimize unnecessary agitation by the fire.

(To be continued.)

RAILWAY NATIONALIZATION.*

BY SIR GEORGE GIBB.

II.

COMPETITION AND CONTROL.

Hitherto for the regulation of railways, reliance has been placed on two factors, competition and control. Parliamentary action and public opinion have veered about from one to the other, and the absence of clear principle in the policy of the Legislature has introduced evils which a more logical and consistent adherence either to the policy of free competition on the one hand, or to the policy of strict control on the other, would have avoided. That some regulation is necessary all would admit. Railways sell transportation as a commodity, but the nature of the business makes it impossible to secure the conditions of absolutely free competition as in the case of other industries. Hence the necessity for control, but every plan of control that has been tried has proved practically inoperative and ineffective, mainly because it has endeavored to leave competition in operation, and it is the evils which necessarily arise from competition which lead to most of the complaints against railways. The inevitable weakness of the dual system of competition and control is that control checks competition just where it would be useful in the public interest, and competition nullifies control just where it could be advantageously applied.

TRADERS' COMPLAINTS.

Under no system could we expect railways to be free from complaints. They arise equally from the nature of the business and the nature of the customers. But with a view to seeing whether State ownership would remedy the complaints that exist, let us try to understand as clearly as possible what the complaints are. The Chancellor of the Exchequer (Mr. Lloyd George), speaking to a deputation of traders in 1906, when he was president of the Board of Trade, said that he was impressed with the "great and growing discontent with the whole system."

Now, what are the causes of the present discontent? Is it

*A paper read at a meeting of the Royal Economic Society, London, November 10, 1908, W. M. Acworth in the chair.

great? Is it growing? These are questions very difficult to answer. But there are some useful data available for the answer. The way has been made plain and easy for complainants against railways. Every encouragement and every facility has been afforded to them. A special court has been created—the Railway and Canal Commission—the constitution of which was carefully framed so as to encourage anyone with a grievance against railways to hope that he would get a sympathetic hearing of his case. The applications to that court were so few that those people who cannot bring themselves to believe that the number of real, as distinct from imaginary, grievances against railways are remarkably few, said that the public were deterred from bringing complaints forward by the expense of litigation before the Railroad Commissioners. So, to render the path of the complainant still easier, a procedure was introduced which is unique for simplicity and cheapness. All, without distinction, who had any complaint or grievance of any sort or kind against any railroad or canal company, were invited to come and lay the same before a Department of Government, the Board of Trade, who practically promised to use their influence to secure an amicable adjustment of any differences. This procedure is so simple, so sweeping, so all-embracing, so encouraging to complainants, and has, on the whole, been exercised by the Board of Trade with so much tact and success, that its records should supply the information we are seeking.

TRADERS' "TIMIDITY."

In view of these efforts to get every aggrieved or discontented person to come forward and disclose his complaint, is it possible to imagine that there are now any concealed complaints? It is often said that traders will not complain, that they are afraid of rousing the hostility of those terrible tyrants, the railways, whose power in England at any rate, whatever it may be in America, is ludicrously exaggerated. It is true that a sensible trader who has a fair case does not fly with it to the Board of Trade. He submits it to the railroad officers in the ordinary daily course of business and almost invariably gets the matter adjusted. But I do not believe that there is any trader who would be deterred from submitting a complaint to the Board of Trade by any feeling of fear. On the contrary, traders in these days suffer from an excess of boldness. If a trader is dissatisfied with any railroad charge he simply refuses to pay, and only those who have experience of the daily conduct of railroad business can know how common, and unfortunately how effective, this remedy is.

BOARD OF TRADE ACTION.

The Board of Trade make an annual report to Parliament of all complaints made to them under their conciliation jurisdiction, and I think the contents of these reports may fairly be relied on as presenting a complete view of the kind of complaints that exist against railroads. A useful table is given in the tenth report of the Board of Trade, issued in July last, showing the total number of complaints for ten years classified according to their nature as follows:

	Total.	No. per annum.
1. Rates unreasonable or excessive in themselves or which were unreasonably increased	715	71.5
2. Undue preference	352	35.2
3. Sundry complaints	510	51
	1,577	157.7

Of the total number, 48 were complaints against canal companies, but these are not separated in the classification.

Surely the above is a remarkable table, considering the vast aggregate of business and the facilities offered for complaints. Only 1,529 complaints against railroads, or an average of about 153 per annum, have been found to exist.

Then look at the results of these complaints. These are given in another table, and only 573 complaints, or an average of 57 per annum, are entered as resulting in the complainants finally expressing themselves as dissatisfied.

Services for which the aggregate payment amounts to 120 millions sterling per annum are rendered, and yet there are only an average of 57 cases pere annum of dissatisfied complainants to the most open, most favorable, and least costly tribunal in the world for hearing complaints against railroads.

Now let us look at the nature of the complaints made. Would state ownership remedy any of these complaints? I set aside the 510 cases of miscellaneous complaints about delay in transit and other minor matters, because it is obvious that complaints about such matters would not disappear under any conceivable system of railroad management.

COMPLAINTS OF EXCESSIVE RATES.

Practically all other complaints group themselves under two heads:

1. Excessive rates.
2. Undue preference.

The complaint that railroad rates are excessive generally takes the shape of a comparison of the charges on some foreign railroad. Now, I confess that it is very difficult to meet such allegations, because of the difficulty of presenting all the conditions of which account must be taken in order to make a fair and sound comparison, and also owing to the absence of adequate data or materials in the published statistics of English railroads.

A general allegation that English rates are higher than those charged in some countries cannot even be discussed, because the factors needed for the comparison are not available. Are they in fact higher is a question the answer to which must precede discussion as to reasons and explanations.

The facts in regard to the average length of haul, the average rate per ton-mile for different kinds of traffic, or the average charge per passenger-mile, and general information as to the nature of commodities carried, speed of transit, and services rendered for the rates charged must be ascertained before any comparison is possible, and these facts are not ascertainable for English railroads.

My belief is that having regard to the capital expended on construction of railroads, English railroad rates are not excessive for the services rendered, and I greatly doubt whether, after making proper allowances for differences in capital cost of railroad accommodation, and for other essentially different conditions, rates in any country are lower, comparing like with like, than railroad rates in England. This is an issue of fact. It lies at the threshold of any inquiry into the subject of railroad rates, and I confess I do not see how much progress can be made with any discussion which turns on assertions as to the relative dearness of English railroad rates until adequate materials are available for a sound comparison.

RAILROAD CAPITALIZATION.

It is true beyond question that English railroads have cost more to construct than the railroads of any other country. The capital expenditure of all railroads in England is represented by the figure of about £56,000 per mile as compared with about £21,000, which is the corresponding figure for German railroads, and about £12,000 per mile for American railroads. Railroad proprietors in England are not responsible for the high capital cost. They were forced by law, and by custom powerful as law, to pay monstrously inflated values for their lands. Burden upon burden has been heaped upon them by the action of the legislature, by the requirements of government departments, and by the exactions of public opinion. They have borne heavy losses in being compelled to spend capital without regard to their ability to secure adequate return upon it, and assuredly no reckoning is due from them to the public in this matter. The reverse would be more true.

DIVIDENDS PAID.

The total capitalization of railroads in the United Kingdom in the year 1907, as given in the Board of Trade Returns, was 1,294 millions sterling, of which 196 millions represents nominal additions. The net earnings (some of which, however, arose from miscellaneous sources independent of the operation of the railroads), amounted to £44,940,000, or 3.47

per cent. on the nominal capital. Out of a total of 1,294 millions sterling, 136 millions of loan and preferential capital received interest or dividends in excess of 4 per cent. This presumably arose from the insecurity of capital, involving the payment of a high rate of interest or dividend. One hundred and eighty-one millions of ordinary capital received dividends in excess of 4 per cent. per annum. The capital receiving interest or dividends in excess of 4 per cent. per annum is, therefore, 317 millions, or 24.5 per cent. of the total. It cannot be said on these figures that the interest received by those who provided the capital for the railroads is excessive,

WASTAGE OF CAPITAL.

But would it be possible for state railroads to reduce the amount included in railroad rates for interest and dividends? It cannot be denied that our present system does involve the needless duplication of railroad accommodation—the inevitable waste of competition. There is the constant endeavor to divert traffic, the corresponding effort to keep it. Capital is wasted, but public facilities are increased. The public could certainly secure by monopoly the saving of waste, but only at the cost of losing the advantages, such as they are, of getting more than they pay for. I suspect that on a broad and comprehensive view, these advantages are not worth to the community the waste of capital involved in providing them. But it is rather late in the day to adopt this view. Enormous waste has already been incurred, and it must be remembered that this drain on the resources of the nation is not likely to be so serious in the future as it has been in the past, even if the system of leaving railroads to private enterprise is not abandoned.

The private ownership of railroads provides for the absorption of the wastage of capital in a manner which would be impossible under state ownership. Eighty-eight millions (pounds sterling) of the capital expenditure on railroads goes without dividend, and 151 millions has to be content with a return less than 2 per cent. per annum. Although this undoubtedly represents a loss to the community, the loss is distributed. It falls on those who voluntarily spent their money in the hope of gain, and lost it. The state cannot lose capital in this way. All expenditure incurred by the state would be represented by money borrowed on the public credit, and the interest would have to be paid in full, whether the expenditure proved remunerative or the reverse.

SAVINGS UNDER STATE MANAGEMENT.

That there would be savings, and large savings, under state management I would not deny, but that is because the railroads would be worked as a monopoly, and not because they would be worked by the state. The same and still larger economies in working could be effected under private enterprise if competition were abandoned in favor of universal combination or monopoly. The whole question depends on the waste of competition. Each railroad company works for its own route. The result is that unnecessary train mileage is run, and train loads are lessened. The secret of success, the foundation of all economy in railroad working, lies in securing the largest possible train loads. This is a simple rule, but it embodies a universal truth. If those responsible for the handling and carriage of railroad traffic could work with a single eye to economical results, and in all cases forward traffic by the routes which yielded the best working results, great economies could undoubtedly be effected. This consideration does indicate that a source of improvement in railroad results would be open to a railroad system under government management which is not available for privately owned railroads competing with one another. And in fairness one must admit that this source of economy obtainable only under the conditions of monopoly must be set down as a point to the credit of state ownership.

EQUAL RATES.

Many of the complaints against railroad rates as excessive are really, when analyzed, complaints of undue preference. They are based on comparisons with other rates and, in nearly every case, it is the factor of competition which lies at the root of the difficulty.

This is the natural result of our mixed system of competition and control. In principle all would admit that there should be equal treatment on railroads. But what is and what ought to be equality are questions in regard to which there is much room for difference of opinion.

To what extent does the law really require equality? The Railway and Canal Traffic Act, 1888, enacts in substance that a railroad company shall not make any difference in the treatment of traders which shall amount to an undue preference. It permits the grouping of places situated at various distances of any point of destination or departure of merchandise, provided that the distances shall not be unreasonable, and that the rates charged and the places grouped together shall not be so grouped as to create an undue preference. Now, in this legislation there is no definite or tangible principle. The legislature has not really made up its mind how traders should be treated. It simply says that any preference given to one trader over another shall not be undue, but the interpretation of the word undue is left open. The prohibition of undue preference only applies to the actions of one company on its own railroad, and therefore covers but a small part of the matter. A trader desiring to have his goods sent to some market which is prejudiced by the competition of goods carried to the same market from some other place by some other railroad which, for some reason or other, good or bad, gives better treatment to its customers --a prejudice far more likely to happen, in fact, than one arising from differences in treatment on the same railroad—is not protected or assisted by any legislation.

THE STATE AND UNDUE PREFERENCE.

The question may be asked whether national railroads would or could cure this somewhat indefinite position?

If railroads were nationalized, would it not be necessary, and would it be practicable to settle the principles to be applied in treating different districts in competition with one another. At present there are no principles if the districts are served by different railroads. If one railroad serves two districts, the law provides that such railroad shall not mete out unequal treatment so as to constitute undue preference, whatever that may mean, but if these two competing districts are served by different railroads, the law shrinks from any interference.

Now, in practically every case the favorable treatment complained of, due or undue, as the case may be, is forced upon the railroad company by competition in some shape or other. It may be competition of other carriers by sea or by land, or it may be the necessity for enabling one district to compete with another less favorably situated. Such consideration for the commercial needs of districts in relatively disadvantageous positions is permitted and encouraged when it is afforded by different railroads, though rendered difficult when one railroad serves the competing districts. What would state railroads do? If the law of undue preference now operative within the limits of particular railroad system became, by reason of state ownership, applicable to all railroads, there would be a stupendous disturbance of existing trading conditions. Instead of state purchase diminishing the complaints of undue preference, it would be the signal for the commencement of fierce conflicts between districts. It would be necessary to face the question whether and to what extent geographical advantage of position should be recognized in fixing railroad rates. The centers of production and consumption in England have been fixed away back in commercial history, and from a railroad point of view, these have largely to be taken as facts beyond control. Facilities for reaching the populous centers of consumption are of vital importance to producers and importers. Would state railroads be compelled by the pressure of interested land owners and others to fix rates for agricultural produce and manufactured articles and

for import and export trade rigidly in proportion to distance?

It is probable that a bitter controversy would arise on this question, and discontent with the railroad arrangements which have gradually, and with very general approval, been established in England, instead of being lessened, would be greatly extended, if we embarked on the experiment of state ownership.

STATE MANAGEMENT.

Would the management of railroads by government officials be, on the whole, better than management by the officers of private corporations working for profit?

That is the question which lies at the root of the subject which we are discussing. So far as I am concerned, I have no inclination to jibe at the management of those enterprises which are conducted by the state and municipal bodies. I do not think that the postal services would be better managed if they were under private control, probably not so well. Municipal tramways show the weakness of public management, chiefly in the tendency toward fixing charges at figures which sacrifice the interests of rate-payers to the interests of the working classes who possess votes, but who generally occupy houses in respect of which they do not directly pay rates. That there would be very grave risks in substituting state management for commercial management of railroads must, I think, be generally admitted.

MUNICIPAL TRADING.

But some of the principal arguments against municipal trading do not seem to me to apply to the working of railroads by the state. Of course, the objection of those who think that no public authority should become directly responsible for the management of any commercial undertaking is as valid against state working of railroads as against municipal working of tramways or municipal supply of electricity for light and power. In both cases there is a restriction of the field of private enterprise, and that is enough for the out-and-out individualist. He is convinced, on general grounds, that all commercial undertakings should be left exclusively to private enterprise. But those who are not prepared to settle such matters on any general theory, and who prefer to weigh the advantages and disadvantages in each case, see that many of the reasons against municipal trading cannot fairly be urged against the national ownership of railroads. Municipal trading is indefensible because it unfairly competes with private traders. Competition in commerce must be fair competition on equal terms, otherwise it fails to secure any of the economic advantages which do undoubtedly flow from the free competition of private traders. A commercial undertaking must be worked for a commercial profit. A municipality raises money on public credit, and thus gains an advantage over every private competitor. It also fixes scales of charges and rates of wages without reference, or, at all events, without exclusive reference, to considerations of profit, and thus makes it impossible for any competing trader to earn a legitimate commercial profit. And to make it possible to do this it uses the power of taxation, and levies rates on the competing traders themselves, so that the municipal business can be carried on without the commercial profit which the private trader must earn in order to live. No one can say that this is fair competition.

Then municipal bodies are, from their composition, unsuitable for carrying on commercial business. Their organization cannot be adapted to commercial management. The individuals who serve on these bodies have neither the time nor, as a collective body, the capacity, for managing the businesses on which they embark with efficiency or success. The difference in results due to the difference between good and bad management is paid for out of the rates.

These considerations do not, however, apply with equal force to the state management of railroads. The state would have a complete and universal monopoly. There would be no private competition left, except, of course, competition by sea or by tramway or by any other mode of conveyance which can compete with the railroads.

EXPERT PERMANENT OFFICIALS.

Then there would not be, it may be assumed, any body like a municipal council who would practicly interfere with the management. There might be advisory councils, like the Prussian State Railway Councils, and, of course, there would be a minister of state responsible to Parliament for the railroad administration, and Parliament itself, already, one may remark in passing, clogged and overburdened with work. But it is certain that whatever the details of the organization adopted might be, the whole of the management would practically be left to the expert permanent officials of the railroads. There is no reason to doubt that railroad officers would serve the state with as much loyalty and with as great a measure of success as they now serve the proprietors. Instead of being responsible to boards of directors and shareholders, they would be responsible to a certain number of officers of state, probably, indeed necessarily, to a large extent recruited from their own ranks, and I do not think that the change would result in much practical difference so far as the work of those who really carry out the duties of management are concerned. The only difference would be that these officers would have in view that they were working for the state instead of for shareholders.

SOCIAL EXPERIMENTS.

There can be little doubt that if railroads were nationalized they would be used as a field for many kinds of social experiments. The combination of philanthropy with business is generally regarded with suspicion, but the conversion of the railroad manager into a social reformer would, I think, arouse serious and legitimate alarm. The certainty which we now possess that the action of any railroad company, whether it be wise or foolish in itself, is wholly commercial in its motives and its aims, is a valuable safeguard. But if railway policy were to become the medium for the promotion of social or even economic theories under the guidance of politicians, would not this be a most alarming peril to trading and industrial interests? One group might insist, by political pressure, that the standard of wages should be maintained at a higher level than could be commercially justified. Another group, or many groups, might devote their efforts to securing the construction of railroads in districts which could not support them with sufficient traffic, with the result of burdening the railroad system with many unremunerative branches for which either traders, passengers, or the taxpayers throughout the country would have to pay. The policy of others would be to make suburban railroads at enormous cost, and run cheap trains to serve the populations resident in large cities, regardless whether such railroads or trains were self-supporting or not. In this policy they would have the ardent and influential support of the owners of suburban land, who would rejoice in the increase of their rents, brought about by the expenditure of public money in creating railroad facilities on uncommercial terms. These are not fanciful dangers. They are the results which we may feel sure would inevitably follow the nationalization of our railroads, and the advantages to be gained from state management would need to be very great to compensate for these burdens.

POLITICAL PRESSURE BY EMPLOYEES.

Another aspect of the question which requires the gravest consideration is that which concerns the position of the state as an employer of labor. There are upward of 620,000 railroad officers and servants. The state would become the direct employer of that huge army, and would have to settle all questions relating to hours, wages and other conditions of service. If a railroad company is unable to settle differences with its men the ultimate resort of the men is the withdrawal of their labor, while the company are free to employ other men who are willing to accept their conditions of employment. Any railway strike on a large scale is a dire calamity to trade

and to the public, but if one were compelled to consider the possibility of a general strike on a national railroad system, even the deplorable results which accompany strikes on privately-owned railroads would seem comparatively insignificant. Probably a railroad department of government would not urge the adoption of compulsory arbitration, if they were themselves concerned, with as much equanimity as they do in the case of strikes on private railroads. It is true that in this matter the advocates of state railroads can point to the comparative absence of labor conflicts in connection with the services now under government control, but municipal undertakings have not been so successful in avoiding labor disputes, and in many cases have secured even the degree of immunity from such conflicts which they enjoy by the concession of terms of employment which constitute heavy burdens on the ratepayers. It seems to me that the danger of serious labor disputes cannot be put aside, and I confess that I am unable to see any safe way of meeting the objection to state ownership on the ground that the state ought to limit, as far as possible, its liability to become directly concerned in such disputes.

CONCLUSION.

In conclusion, I would say that I have felt unable to take up a partisan attitude on the question. For many years past both my studies on railroad subjects and my practical experience have led me to a convinced belief in the advantages of well-regulated monopoly, and I am unable wholly to disapprove of a scheme which would secure for the country the advantages of a system of well-regulated monopoly in which I believe, even although it should come in the guise of state ownership.

Competition, in my judgment, creates more evils than it cures, especially the half-hearted and imperfect competition which exists in England so far as railroads are concerned, which cannot be regarded as free competition on a commercial basis.

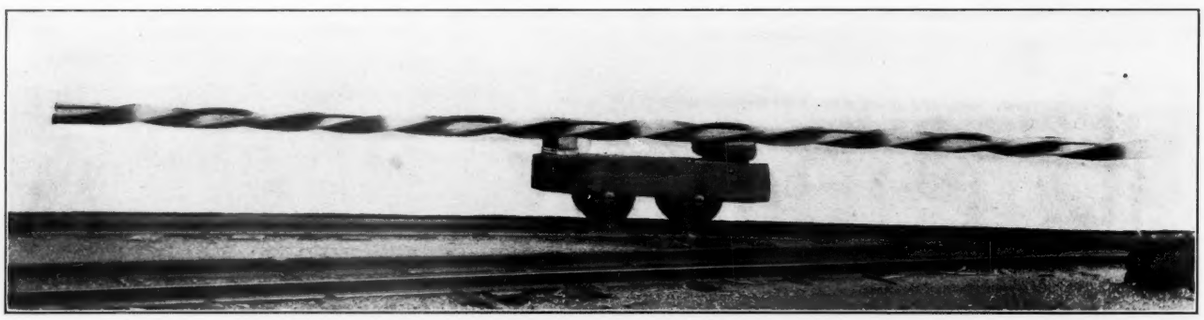
I recognize that it is impracticable to secure unification or any very extensive or far-reaching combinations of railroads under our system of private ownership. The public would not tolerate uncontrolled railroads under private management, and I doubt whether any form of control which has yet been devised, or is likely to be devised, combined with partial competition, can give entirely satisfactory results. That there are grave dangers and risks in the public ownership of railroads I fully admit; indeed, so grave are they that I think he would be a very bold Minister who would venture to bring forward, under government sanction, a proposal for the nationalization of our railroads. The existence of such a huge amount of government patronage would open the door to political corruption. The existence of such an enormous body of government servants possessing the franchise—and I confess it seems to me impracticable to hope that any measure could be carried subject to disfranchisement of government servants—would imperil the financial stability of the railroad system, and introduce new and very serious sources of weakness and danger into the body politic.

The risk of loss from the charging of unduly low rates under pressure from the influential body of traders seeking to enrich themselves at the expense of the general community seems to me a risk which no thoughtful man can ignore. No expedients for checking and restraining political influence so that it could not reach or sway the decision of the officers of state responsible for railroad management seem to me practicable under our democratic constitution.

If the nation owns the railroads, the nation must take all the risks of state ownership, and we could only trust that the existing purity of our politics and the common-sense, honorable character and long experience in self government of the English people would suffice to protect the commonwealth from these perils resulting in serious harm. But whatever may be the issue of the consideration of the question of state purchase of railroads, I am prepared to believe that English railroads will continue, whether under state management or under private management, to deserve the praise which W. M. Acworth expressed in his recent address as President of the Economic Section of the British Association in Dublin, by saying that in his judgment, after I may remind you, a fuller study of railroad conditions in all countries of the world than has been given to the subject by many men in England—that "English railroads are, on the whole, among the best, if not actually the best, in the world."

ROLLED MANGANESE STEEL RAIL.

The Manganese Steel Rail Co., Hillburn, N. Y., has a process for rolling manganese steel rail and other shapes instead of casting them. The resulting rail can be bent, twisted and distorted cold, as shown in the accompanying photographs, without breaking or developing cracks. It has a high elastic limit with ultimate strength of about 140,000 lbs., and elongation about 35 per cent. It is so hard and tough that its life is from 20 to 80 times that of a Bessemer rail.



Rolled Manganese Steel Rail Twisted Cold.

The composition of this rolled rail is the same as that of the best grade of cast manganese steel usually used for frogs and crossings. This is as follows:

Manganese	11.50	per cent. to	12.00	per cent.
Carbon	1.00	" "	1.20	"
Silicon	0.30	"		
Phosphorus	0.065	"		
Sulphur	0.030	"		

While the company believes that this is the best composition to stand wear, there is some difference of opinion, so it has made tests of rolling rails of different analyses. It finds it can successfully make rails of the following composition:

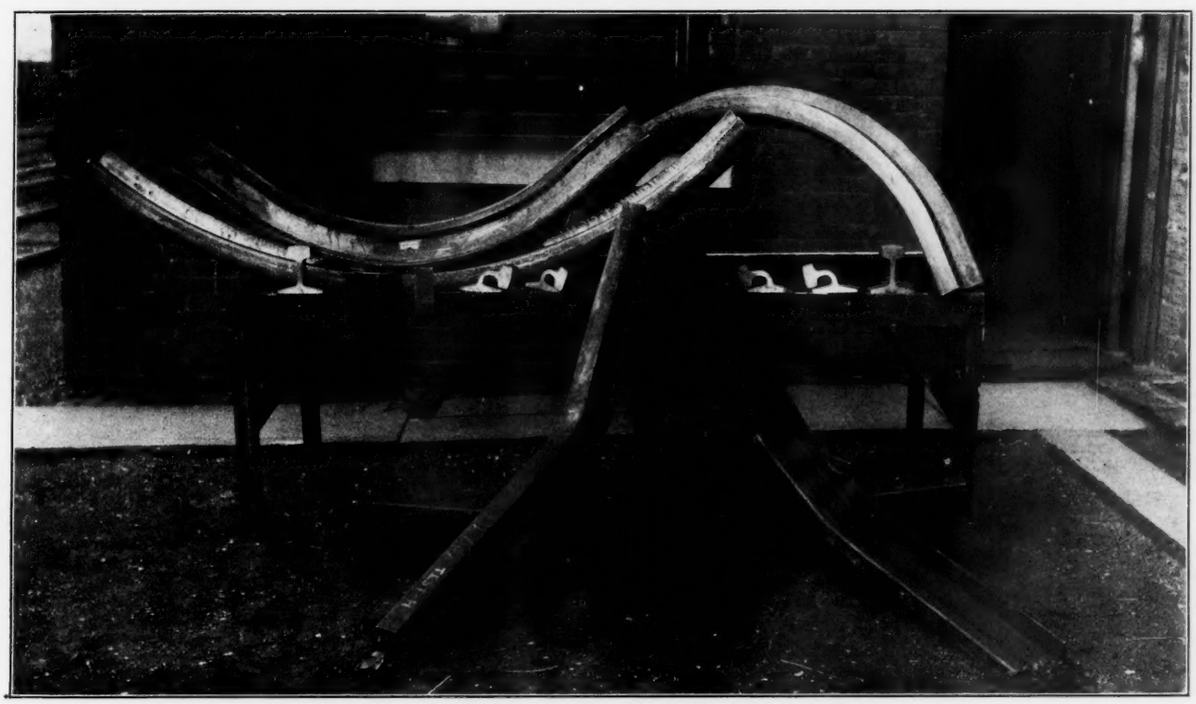
Manganese	9.50	per cent. to	16.25	per cent.
Carbon	0.12	" "	1.35	"
Silicon	0.10	" "	1.00	"
Phosphorus	0.065	"		
Sulphur	0.030	"		

The physical properties of the metal between these limits of manganese does not show any great variation. At 11.50 per cent. to 12.00 per cent., the metal is absolutely non-magnetic and tests for wear indicate that this is the best alloy. The percentage of manganese between 9.50 per cent. and 16.25

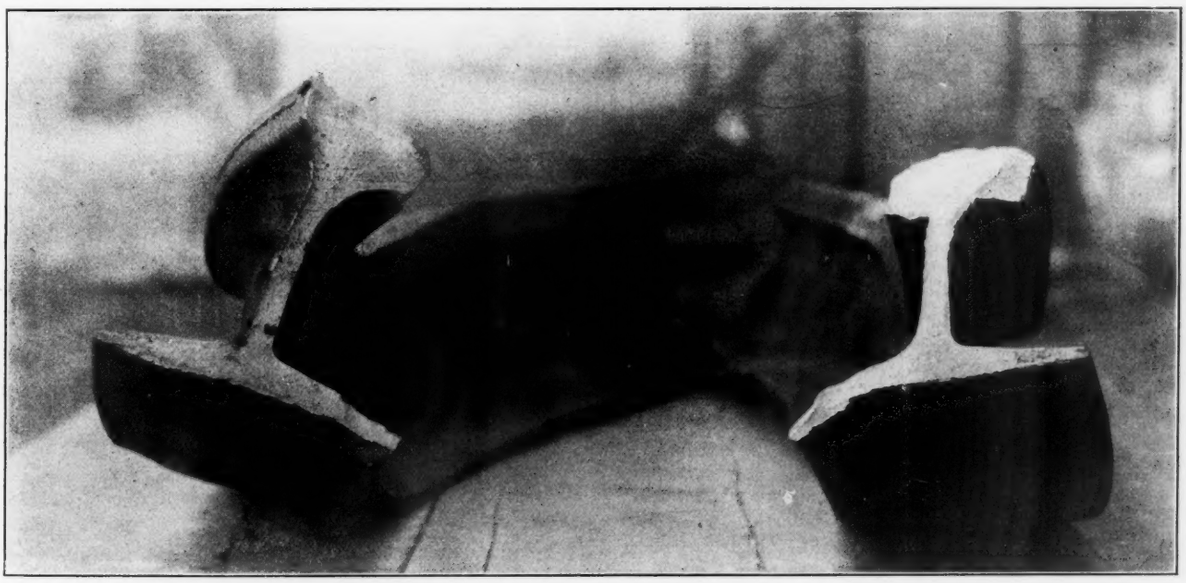
per cent. does not affect the electrical resistance of the rail appreciably. The resistance is about three and one-third times that of the Bessemer rail, but there is a process of plating the rail which will not add much to its cost and will increase the conductivity as well as prevent its rusting. In any case, however, the resistance is not high enough to interfere with track signal circuits.

The accompanying photographs are of specimen bars taken from a 135-ton recent rolling of 85 lb. A.S.C.E. manganese steel rail at the Passaic Steel Company's mills. The twisted bar is 29 ft. long; it was given about six twists and held in that position about 24 hours. On releasing the rail, four twists remained as a permanent set.

In the second photograph, the curved rail resting on its ends on top of the frame was bent to a radius of about 4 ft. The piece leaning against the frame on the right was placed in standard rail test machine 3 ft. between supports and given a blow by a 24-ft. drop of 2,000 lbs. weight, first on top of head, then on base, thereby straightening the rail, and then on one side, giving rail the large side sweep apparent in the picture. The one on the left leaning against the frame was given six successive blows from drop of 2,000 lbs. weight at heights of 4 ft., 6 ft., 8 ft., 10 ft., 12 ft. and 14 ft., respectively. The piece lying on the ground was given one blow by 19-ft. drop of 2,000 lbs. weight, showing in this 85-lb. rail a deflection that compares favorably with an average test of 100-lb. high carbon Bessemer rail. The preceding three tests were made by R. W. Hunt & Co., Chicago. In none of these cases was there any fracture. The short sections of rail resting on the frame with head hammered down over one side to touch the base, under steam hammer, illustrate probably the most severe tests. All the test pieces illustrated were bent cold,



Sections of Rail After Bending and Drop Tests.



Rolled Manganese Steel Rail Tested to Destruction.

probably at about 70 deg. Fahr. But tests have also been made at 5 and 10 deg. below zero Fahr., with equally good results, showing that the rail retains its extreme toughness at low temperature. Preparations are under way for making tests at much lower temperatures, using liquid air. It is intended to carry these tests far enough to find at what point, if any, the metal becomes brittle.

A test to destruction with the purpose of exhibiting a complete transverse fracture was conducted by the manufacturers as follows:

Rail 5 ft. long, supports 3 ft. 6 in. apart. Weight of ball 4,375 lbs.

Blow.	Height.	Vertical deflection.	Blow.	Height.	Vertical deflection.
1st.	15 ft.	8-in.	4th.	30 ft.	22-in. fracture, half flange, half web.
2d.	20 "	13-in.			
3d.	25 "	16-in.	5th.	40 "	Complete fracture.

Both faces of the fracture of this rail are shown in the photograph. They show a very finely and uniformly crystaline structure throughout the broken section. The dark spots are rust, developed after the test. The section of rail head is greatly distorted, and the section of head was materially reduced before fracture could be obtained. The first four blows were applied vertically to the head of the rail. These bent the rail to the shape of a horseshoe. It was then turned on its side, one end resting on an ingot, and the final blow was delivered on the side of the rail at the other end.

The manganese steel rail cannot be drilled or machined commercially, yet the rail can be cut to any length by a friction saw and holes punched and drifted accurately for joint bolts and bonding. Also, this rail can be used quite extensively in connection with manganese steel castings in frog and crossing work. The Ramapo Iron Works, Hillburn, N. Y., an associated concern, furnishes several designs of frogs and crossings of this character. Punching holes in the rail does not injure the metal, as test pieces of rail punched full of holes have stood extraordinarily severe tests. While it takes a little more pressure to bend the manganese rolled rail than the Bessemer rail, yet it can be readily curved by an ordinary portable rail bender, and the rail cannot be broken in this way even when bent to a radius as short as 4 ft.

While there has not yet been opportunity for testing this rail for any great length of service, there are many tests now under way. The first experimental bars of manganese steel rolled rail were cut up and used for frog wings nearly two years ago. These frogs have already given the life of about eight Bessemer rail frogs, and are still in service. From measurements made of these frogs and comparing same with Bessemer rail frogs subjected to the same amount of wear, the difference in flange wear in favor of the manganese steel rail (as near as can be calculated) is from 29½ to 1, to 48 to 1. The flow of the metal on the head of manganese rails did not in any case exceed 1/32 in., while Bessemer rail frogs placed similar conditions in one-eighth the time showed a flow on top of about ¼ in. outside of the line of original side surface of the rail head. There are many tons of this rolled manganese steel rail now doing excellent service on curves in different parts of the country, but as these have had only about two months' service it is too early yet to measure any wear. The rolled manganese steel has a much finer and more uniform grain than the cast metal, and will give more reliable results. As might be expected, the rolled manganese can be furnished at much lower cost than the cast metal. The general objections to cast metals, and also the high cost, has largely limited the use of cast manganese steel rail. Still, very good results are being obtained with cast manganese steel rail in 20-ft. lengths on the Boston Elevated and on some other roads. The records of wear of cast manganese steel are of value in giving an idea of what to expect from the rolled metal. The following tables in this connection from "Report of Wear of Manganese Steel Rail on Curves," by H. M. Steward, Roadmaster, Boston Elevated Railway Co., read before the last American Street & Interurban Railway Association convention show clearly comparisons of length of life obtained and large reduction in maintenance cost. The rail in this table was subjected to top wear only, as it was protected from side wear by continuous guard rails.

Comparative Life of Several Kinds of Steel Rails on Typical Sharp Curves. Speed of Trains, from 8 to 10 M. P. H.

		Rails									
		Bessemer									
		Ordinary.		High carbon,		Nickel,		Manganese		Open-hearth,	
Location of curve.	Radius.	Mos.	Dys.	Mos.	Dys.	Mos.	Dys.	Mos.	Dys.	Mos.	Dys.
Park St., S. B.*...	82 ft.	3	3	8	18‡	3	12‡	76	4†	1	11
Adams Sq., N. B.*.	89 "	2	17	10	15	4	4‡	80	10‡	1	27
Park St., S. B.*...	90 "	2	16	10	11‡	4	3‡	66	15†	1	20‡
Haverhill St., N. B.	100 "	4	3	11	13	6	19	128	9‡	2	21
Sullivan Sq., loop..	106 "	3	7	13	8	5	7‡	101	5‡	2	7

*Subway.
†Still in service.
‡Estimated life from actual results on curves of similar radii.

The following table shows the estimated comparative cost of maintenance per linear foot of single rail for a period of eight years:

	Cast manganese.	Bessemer.
Cost of rail, per ft.	$6.70	$19.50*
Bonds, spikes, etc.	.09	3.25
Labor	.22	15.50
Tie renewals, due to spike killing..	.00	2.90
Total	$7.01	$41.15

*The cost of Bessemer rail per ft. includes 50 renewals.

The substitution of the rolled manganese rail for the cast manganese in the above would show a still much greater saving in cost of maintenance as the price of the rolled manganese is only about $2.20 a foot.

SOUTHERN PACIFIC AIR BRAKE TESTS.

II.

AIR-BRAKES FOR PASSENGER CARS.

Many conditions affecting the operation of passenger trains have changed since the first introduction of the high-speed type of air-brake equipment. Trains have become longer and heavier by virtue of increased number of vehicles, and by greatly increased length and weight of coaches and sleepers.

To handle the heavier and longer trains in service with the facility of former shorter and lighter trains requires improved appliances, but the increase in traffic which brought the longer and heavier vehicles requires trains to be run more frequently, putting still heavier demands upon the locomotive for quicker acceleration and on the air-brake equipment for flexibility of operation and increased factor of safety.

Considerations of safety also demand that, on account of the higher speeds, heavier trains and more frequent service, the braking power or dynamic friction between the brake shoes and wheels used for emergency stops to save life or property, be limited in amount only by the static friction or adhesion of the wheels to the rails.

Exhaustive experiments have determined that while the relation between the weight of vehicles and the adhesion of wheels to the rails has remained unchanged, yet with the higher speeds and heavier trains the coefficient of friction between the brake-shoes and the wheels does not vary with the changes in speed during stops in the same degree as with lighter vehicles, so that brake-cylinder pressures are now permissible, for use in emergency, that have not been considered expedient heretofore, and which are beyond the attainments of standard high-speed air-brake equipment.

Regard for the comfort of passengers and the minimizing of wear and tear on rolling stock; economy of time, which is of great importance where stops are frequent; the necessity for stops being made with accuracy as well as smoothness; the necessity for making one brake application after another in quick succession; the necessity for controlling trains easily and smoothly when running at either high or low speeds, that stops may be made quickly and with the least liability of wheel sliding; all of these conditions, most of which are incident to present-day requirements, make it necessary to provide air-brake apparatus containing the following essential features of operation:

1st. For high-speed trains a brake-cylinder pressure must

be available for emergency applications, which is high enough to maintain the proper coefficient of friction between brake-shoes and wheels through the changes due to high speed and greater heat developed throughout stop on account of increased weight of train, and this high pressure must be secured promptly enough to permit approaching the same rate of retardation at beginning of stop as pertains during latter portion of same.

2nd. It must be possible to make service applications of the brakes quickly and effectively, without danger of making an emergency application.

3rd. It must be possible for engineer to graduate the pressure out of the brake cylinders in release, as well as into the cylinders in applications, with the desired flexibility.

4th. It must be possible to make brake applications of partial or full power as desired in rapid succession, and in the event of pump failure on grade the stored volume must be sufficient to provide the proper factor of safety.

5th. It must be possible to absolutely avoid securing emergency pressures when service applications are made.

To meet these requirements the Westinghouse Air-Brake Company developed the Type L Triple Valve, which is of the quick-action pipeless type, and has incorporated in it all of the functions of the triple valves now in use, as well as additional features to meet the new conditions above mentioned, as follows:

1st. High emergency pressure feature. 2nd. Quick service feature. 3rd. Graduated release feature. 4th. Quick recharge feature. 5th. Service application safety valve feature.

OBJECT OF THE DEMONSTRATIONS.

The demonstrations as described on the following sheets were made for the purpose of obtaining records of the operating conditions governing the requirements of air-brake equipment, to show the limitations in standard passenger car triple valves for serving present day needs, to demonstrate the existence of the necessary improvements in the Type L triple valves to meet present conditions by comparing their operation under similar circumstances with the standard valves, and further, as far as possible to determine the benefits to be derived from their use.

The features peculiar to the Type L triple valves, of which records were made, are:

The high-emergency pressure feature, which greatly increases the available braking power in emergency applications over the maximum obtainable with standard triple valves, as through this feature of the L triple the same cylinder pressure in emergency may be secured from 90 lbs. initial pressure as from 110 lbs. with standard triple valves. These high-emergency pressures may be retained intact throughout the progress of the stop, or be partially or completely released by the engineer if desired. The control of pressure into and out of the brake cylinders being placed by the L triple valves entirely in the hands of the engineer.

The quick service feature, which hastens the time of serial action of the brakes through the train in service applications is similar to the quick action in emergency, but less in degree.

The L triple valves make a local reduction of brake-pipe pressure on each vehicle in service applications by taking a quantity of air out of the brake-pipe and admitting same to brake-cylinder, this local reduction setting the triple valve into action on next adjoining vehicle, the air placed in the brake-cylinder being equal approximately to the displacement of the piston, permitting the air then admitted from the auxiliary reservoir to extend the packing leather, move the piston beyond the leakage groove and build up pressure immediately, causing a prompt and efficient response of all brakes in the train with service applications, and thereby practically eliminating the need for emergency applications except to save life or property.

The graduated release feature, which permits of partially or completely releasing the brakes on the entire train at will, places the control of the train in the hands of the engineer in a way never before possible, and permits the smoothness of operation which has long been hoped for, but never attained with standard equipment which completely released when a graduation of release was desired.

The quick recharge feature, through which the proper stored volume of compressed air is kept available in the auxiliary or braking reservoirs is one of the most important improvements. The inability to obtain, heretofore, full braking power with any brake application which might become necessary immediately or in a short time after a release of brakes with standard equipment has made it necessary to use supplementary devices, such as retaining valves, to even approach the desired factor of safety.

With the L triple valves it is possible to obtain full braking power with applications and releases in quick succession without materally depleting the system.

Next to the high emergency pressure feature, the quick recharge of the auxiliary reservoirs is most important in increasing the factor of safety. The value of this feature cannot be overestimated for grade work, as not only are the auxiliary reservoirs promptly recharged from the brake-pipe supplied in turn from the main reservoir on locomotive, but an additional supply of stored volume is available from the supplementary reservoirs sufficient to handle the train for a considerable period in event of failure of air supply, which still further increases the factor of safety.

The service application safety valve feature, through which a safety valve of large capacity is connected to the brake-cylinder in service applications only, is an absolute protection against excessive pressures except in emergency. With standard equipment the brake-cylinder pressures are often excessive in service applications, causing wheel sliding and rough stops.

These, as well as other valuable features are incorporated in the L triple valve, besides the perfection of mechanical design and construction only possible with years of experience in developing and manufacturing air-brake apparatus.

THE TRAIN AND EQUIPMENT.

The demonstrations were made with standard and improved passenger air-brake equipment on the comparatively level track between Hayward and Niles, Cal., on the Western Division, the chronograph station being near Halvern siding.

A class A-81-20-28-105 locomotive No. 3026 was used and eight passenger cars, Nos. 32, 33 and 3076, buffet and five standard coaches class 60-C No's 1317, 1316, 1359, 1314 and 1354. Some of the maximum speed runs were made with the locomotive and five cars only. The cars were fitted with standard high-speed brake equipment, and also with Westinghouse schedule LN complete, including L triple valves and supplementary reservoirs.

The two brake equipments were so arranged that either one could be out temporarily, and the other cut in and operated, thus permitting demonstrations intended to be comparative to be made immediately following each other under as nearly the same conditions as possible. The locomotive used for handling the train was fitted with standard high-speed brakes and with Westinghouse schedule No. 6 ET, complete, both so arranged that either could be cut in or out, as desired, to correspond with the car equipment used during any given demonstration. The ET equipment was cut in when the schedule LN equipment was in use on the cars, and the standard high-speed equipment was used with the same type on the cars. The locomotive was fitted with a Boyer speed recorder, to guide the engineer in regulating speed of train, when preparing for stops.

A chronograph to record speed at time of application, rate of retardation, length of stop in feet and time in seconds, was located at the side of track and connected to circuit-breakers on that portion of the track where the stops were made.

The brake applications for the emergency stops were made with a trip mechanism installed on the engine and operated by a trip block on the track.

The circuit-breakers were placed 66 ft. apart on that part of

the track preceding the trip which applied the brakes to record the speed at time of application.

On the level track at Halvern, beyond the trip, where retardation occurred, the circuit-breakers were placed 100 feet apart for convenience in figuring distance and plotting the speed distance curves.

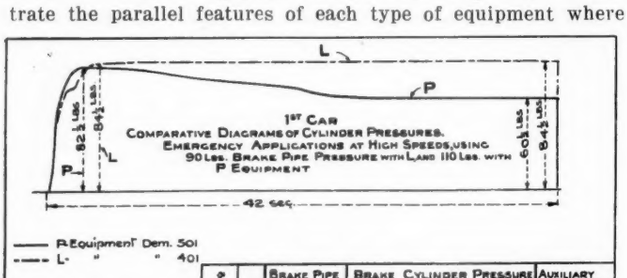
Cylinder pressure indicators were connected to brake-cylinders on two cars, one near front and one near the rear of train for the purpose of obtaining indicator cards during the different demonstrations. These two cars also had gages applied to brake-pipe and auxiliary reservoirs, which were read by observers.

The other cars had gages fitted to brake-cylinders, read by observers.

Time of duration of stop was also taken with stop watches by observers, and wheel sliding, if any, noted by observers riding platforms for that purpose.

PASSENGER STANDING DEMONSTRATIONS.

It was desired to obtain readings of delicate instruments on different cars throughout the train, which could not be made during the running tests. Records were, therefore, taken of the operation of the equipments with the train at rest to secure data from which comparative curves could be plotted to illustrate the parallel features of each type of equipment where



Key to Gauge Readings
A = At start of Application
E = At end of Application
I = Initial Brake Cylinder Press.
BR = Just before Release
H = Maximum
L = Minimum

Demonstration No.	Equipment Used.	Brake Pipe Pressure Lbs. Time of Gauge Reading	Brake Pipe Pressure Lbs. Engine	Brake Pipe Pressure Lbs. 1st Car	Brake Cylinder Pressure Lbs. Time of Gauge Reading	Brake Cylinder Pressure Lbs. Engine	Brake Cylinder Pressure Lbs. Tender	Brake Cylinder Pressure Lbs. 1st Car Gauge	Brake Cylinder Pressure Lbs. 1st Car Indicator	Brake Cylinder Pressure Lbs. 7th Car Gauge	Brake Cylinder Pressure Lbs. 7th Car Indicator	Auxiliary Reservoir Pressure Lbs. Time of Gauge Reading	Auxiliary Reservoir Pressure Lbs. 1st Car	Auxiliary Reservoir Pressure Lbs. 7th Car
501	P	A	111	110	I	70	90	83½	62½	82½	78	H	110	110½
		E	0	0	BR	45	59	59	60½	57½	56	L	59½	58½
401	L	A	90½	90½	I	75	78	85½	84½	86½	82	H	90	90½
		E	0	0	BR	—	—	84½	84½	85½	82½	L	76	75

Fig. 18—Passenger Standing Demonstrations.

Emergency applications. 90 lbs. brake-pipe pressure with **L**, *and 110 lbs. with* **P** *equipment.*

similar functions are performed, and to show the additions and refinements in the improved equipment.

To illustrate the operation of that feature of the L triple valves through which high brake-cylinder pressures are secured in emergency applications and maintained throughout the progress of a stop, emergency applications were made, using 90 and 110 lbs. brake-pipe pressures. Brake-cylinder indicator diagrams and gage readings were taken of the pressure secured in the cylinders on 1st and 7th cars.

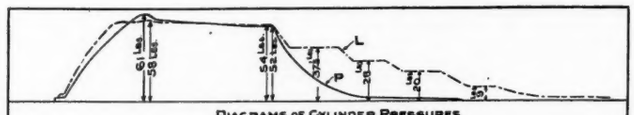
In Fig. 18 are given the gage and indicator pressure readings from 110 lbs. brake-pipe pressure with P. triple valves (standard equipment), and from 90 pounds brake-pipe pressure with L triple valves (improved equipment).

On upper part of the diagram are also shown tracings from the indicator charts taken on first car, and it will be of interest to note that from 110 lbs. brake-pipe pressure, 82½ lbs. brake-cylinder pressure was secured at beginning of application with P triple valves, and reduced to 60½ lbs. at end of application, whereas from but 90 lbs. brake-pipe pressure, 84½ lbs. brake-cylinder pressure was obtained with the L triple valves, and this pressure was maintained absolutely until released.

It will be readily appreciated why a stop can be made with L triple valves with 90 lbs. brake-pipe pressure in as short or shorter distance than with P (standard) triple valves with 110 lbs. brake-pipe pressure.

GRADUATED RELEASE FEATURE.

One of the important improvements which is incorporated in the L triple valve is a feature which places in the engineer's hands the control of the brake-cylinder pressures during the release of brakes. The pressure may be graduated out of the brake-cylinders on passenger trains of any length in a similar way to the graduations of pressure into the cylinders



Key to Gauge Readings
A = At Start of Application.
E = At End of Application.
I = Initial Brake Cylinder Pressure.
BR = Just before Release.
H = Maximum.
L = Minimum.
C = After 1st 2nd & 3rd Graduation of Release.

Demonstration Number	Equipment Used.	Time of Gauge Reading	Main Reservoir Pressure Lbs.	Brake Pipe Pressure Lbs. Time of Gauge Reading	Brake Pipe Pressure Lbs. Engine	Brake Pipe Pressure Lbs. 1st Car	Brake Cylinder Pressure Lbs. Time of Gauge Reading	Brake Cylinder Pressure Lbs. Engine	Brake Cylinder Pressure Lbs. Tender	Brake Cylinder Pressure Lbs. 1st Car Gauge	Brake Cylinder Pressure Lbs. 1st Car Indicator	Brake Cylinder Pressure Lbs. 7th Car Gauge	Brake Cylinder Pressure Lbs. 7th Car Indicator	Auxiliary Reservoir Pressure Lbs. Time of Gauge Reading	Auxiliary Reservoir Pressure Lbs. 1st Car	Auxiliary Reservoir Pressure Lbs. 7th Car	Sur. Res. Press. Lbs. 1st Car	Sur. Res. Press. Lbs. 7th Car
515	P	A	130	A	111	110	I	38	60	66	65	65	61	H	111	110½		
				E	90½	90½	BR	—	—	55½	57½	57½	52	L	93	88½		
				1-C	92½	—	AR	0	0	0	0	0	0	1-C	—	92		
		BR	140	2-C	94	—												
				3-C	95½	—												
415	L	A	111	A	91	89½	I				65		58	H	90	89½	91	89
				E	70½	69½	BR	57	60	66	64	55	54	L	69	69½	—	—
		BR	112½	1-C	73½	—	1-C	36	38	45½	46½	38	37½	1-C	—	73	89	88
				2-C	75	—	2-C	25	28	33	36	28	28	2-C	—	75	87½	87
				3-C	78	—	3-C	10	15	26½	27	20½	20	3-C	—	77	86	85
		H	122½	4-C	82	—	4-C	0	0	16	16	9½	9	4-C	—	80	85	84

Fig. 19—Passenger Standing Demonstrations.

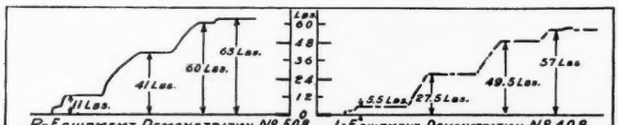
Showing control of brake cylinder pressure by engineer during release of brakes.

during applications, thus permitting smoother and shorter stops without the necessity of making additional brake applications.

With standard and other triple valves all pressure escapes from brake-cylinders during release, except, of course, where retaining valves are used. It will also eventually become unnecessary to use retaining valves, as any pressure desired may be held in the brake-cylinders with the L triple valves.

In Fig. 19 are shown the results of comparative heavy service applications and releases of brakes from 110 lbs. brake-pipe pressure with P triples and from 90 lbs. with L triples.

The pressures are given in the table and for ready observance



Key to Gauge Reading.
A = At start of Application.
E = At end of Application.
I = Initial Brake Cylinder Pressure after each Reduction.
BR = Just before Release.
H = Maximum.

Demonstration Number	Equipment Used.	Time of Gauge Reading	Brake Pipe Pressure Lbs. Engine	Brake Pipe Pressure Lbs. 1st Car	Time of Gauge Reading	Brake Cylinder Pressure Lbs. Engine	Brake Cylinder Pressure Lbs. Tender	Brake Cylinder Pressure Lbs. 1st Car Gauge	Brake Cylinder Pressure Lbs. 1st Car Indicator	Brake Cylinder Pressure Lbs. 7th Car Gauge	Brake Cylinder Pressure Lbs. 7th Car Indicator	Time of Gauge Reading	Auxiliary Res. Pressure Lbs. 1st Car	Auxiliary Res. Pressure Lbs. 7th Car
508	P	A	110	109								H	110	110½
		A	104	102	I	—	—	—	21	11½	11	E	104½	104½
		A	96	95	I	—	—	—	50½	42	41	E	95	96½
		A	90	—	I	—	—	65	65½	63	60	E	89	99½
		A	84	87½	I	—	—	—	—	67	63	E	84	83½
		E	76	75½	BR	70	48	—	62	65	57	E	75	75½
408	L	A	101	100								H	101	100
		A	96	94	I	—	—	34	—	8½	5½	E	—	96½
		A	93	90½	I	—	—	—	45½	30	27½	E	90	91½
		A	86	84½	I	—	—	65	65½	53	49½	E	—	85
		A	81	79½	I	—	—	62	—	62	59	E	80	79½
		E	75	74½	BR	70	74	—	64½	63	59	E	74	75

Fig. 20—Passenger Standing Demonstrations.

Characteristic cylinder-pressure diagrams. **L** *and* **P** *equipment operated by light-service reductions.*

of the complete control of brake-cylinder pressures during release which is possible with L triple valves, the comparative brake-cylinder indicator cards, taken on seventh car, are shown in upper part of the plate.

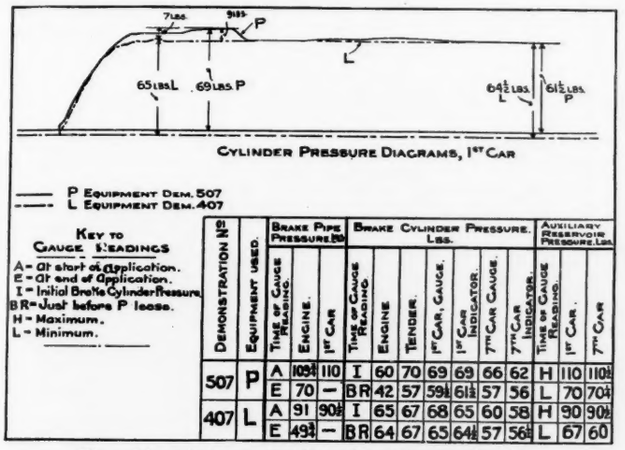
It will be noted that four effective graduations were possible on seventh car, and all other cars in train, with the L triple before final release as against the complete escape of pressure after start of release with the P triple valve.

The advantage of this facility for graduating the pressure

out of the cylinders in release in reducing shocks during stops and controlling trains on grades will be readily appreciated.

QUICK SERVICE FEATURE.

In Fig. 20 are shown the comparative effects of light brake-pipe reductions in graduating the pressure into the brake cylinders in making applications of the brakes.



Demonstration No.	Equipment used.	Brake Pipe Pressure. Time of Gauge Reading	Brake Pipe Pressure. Engine.	Brake Pipe Pressure. 1st Car	Brake Cylinder Pressure. Lbs. Time of Gauge Reading	Engine	Tender.	1st Car, Gauge.	1st Car Indicator.	7th Car Gauge.	7th Car Indicator.	Auxiliary Reservoir Pressure, Lbs. Time of Gauge Reading	1st Car.	7th Car
507	P	A	109½	110	I	60	70	69	69	66	62	H	110	110½
		E	70	—	BR	42	57	59½	61½	57	56	L	70	70½
407	L	A	91	90½	I	65	67	68	65	60	58	H	90	90½
		E	49½	—	BR	64	67	65	64½	57	56½	L	67	60

Fig. 21—Passenger Standing Demonstrations.

Value of L equipment compared with P in protecting cars against excessive cylinder pressures with heavy-service reductions.

On the lower part of the diagram are shown the brake-pipe pressures used, the reductions made and the brake cylinder pressures secured in each graduation.

For ready observance of the effect of the quick service feature, the comparative brake cylinder indicator diagrams are shown on top part of the plate.

It will be of interest to note the prompt and effective rise of pressures in the brake cylinders on the 7th car with the L triple valve, as shown by the tracings of indicator card, as against the longer time taken for the graduations with the P triple valve.

In addition to securing the pressures, as shown by the cards illustrated, it might be mentioned that an equally important result is accomplished by the quick service feature setting the next triple valve into action by the local brake-pipe reductions thus made.

SERVICE APPLICATION SAFETY VALVE FEATURE.

One of the very important features of the L triple valve is the arrangement of ports through which a safety valve of large capacity is connected to the brake cylinder during service applications only, these safety valve ports being blanked in emergency applications.

The purpose of this safety valve is to prevent excessive brake cylinder pressures from heavy service applications.

In Fig. 21 are shown the results of comparative maximum service applications made from 110 lbs. brake-pipe pressure with P triple valves, and from 90 lbs. with L triple valves. The official figures showing pressures are given in the table, and for ready comparison a tracing is shown on the upper portion of the plate of the indicator cards taken on first car with both equipments.

It will be of interest to note that 65 lbs. brake cylinder pressure was secured in the early part of the application with the L triple valve and maintained uniformly until released, whereas during the beginning of the application with the P triple 69 lbs. was secured, which was later reduced by the high-speed valve to 61½ lbs., but not until a considerable period of time had elapsed, as against the prompt governing of the maximum pressure by the safety valve of the L triple.

QUICK RECHARGE AND PRESSURE MAINTENANCE FEATURES. EMERGENCY APPLICATIONS.

A feature second in importance only to the securing of high pressures in emergency has been added to the L triple valve, through which the stored volume is replaced in the auxiliary reservoirs promptly after an application, as against the slower recharge with triple valves heretofore in use.

This feature together with the additional stored volume in the supplementary reservoirs used with the complete schedule LN equipment makes it impossible to deplete the reserve stored volume beyond a safe limit.

To illustrate this quick recharge and the benefit of the additional stored volume, repeated emergency applications were made at frequent intervals with both equipments using 110 lbs. brake-pipe pressure with the P. equipment and 90 lbs. with the L.

While the first initial brake cylinder pressure with both equipments was 84½ lbs., yet with the P triple valves the cylinder pressure secured from each succeeding application was not within 25 lbs. of this pressure, whereas the cylinder pressure secured successively with the L triple valves showed a loss of but 8 or 9 lbs., being 75 lbs. in the first car at the 5th application, as against 54½ lbs. in the first car with the P triple valve at the 5th application.

In Fig. 22 will be seen tracings from indicator cards on 1st and 7th cars, showing graphically the results of the demonstrations of which the official figures have already been shown.

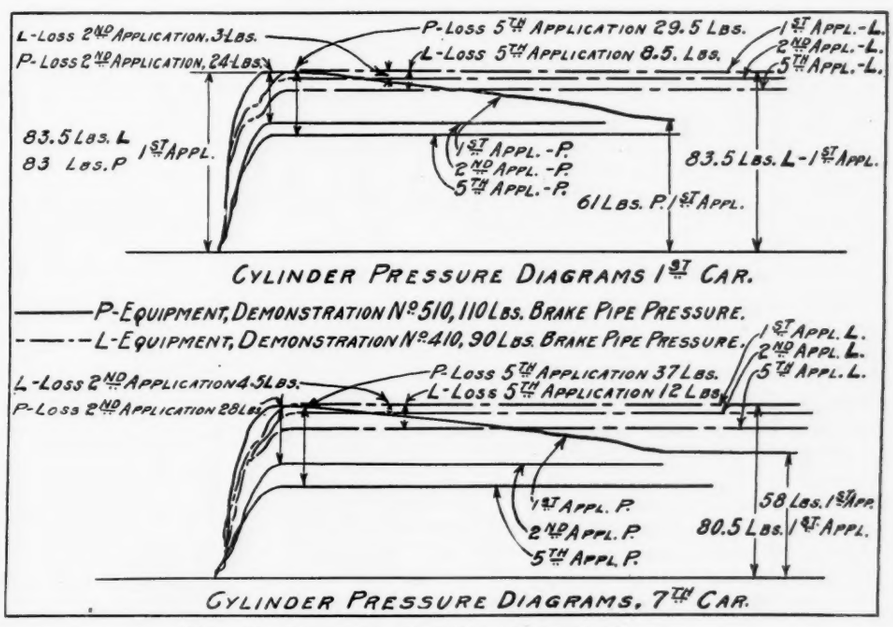

L-LOSS 2ND APPLICATION 3 LBS.
P-LOSS 2ND APPLICATION 24 LBS.
P-LOSS 5TH APPLICATION 29.5 LBS.
L-LOSS 5TH APPLICATION 8.5 LBS.
1ST APPL.-L.
2ND APPL.-L.
5TH APPL.-L.
83.5 LBS. L
83 LBS. P 1ST APPL.
1ST APPL.-P.
2ND APPL.-P.
5TH APPL.-P.
83.5 LBS. L-1ST APPL.
61 LBS. P. 1ST APPL.
CYLINDER PRESSURE DIAGRAMS 1ST CAR.
P-EQUIPMENT, DEMONSTRATION No. 510, 110 LBS. BRAKE PIPE PRESSURE.
L-EQUIPMENT, DEMONSTRATION No. 410, 90 LBS. BRAKE PIPE PRESSURE.
1ST APPL. L.
2ND APPL. L.
5TH APPL. L.
L-LOSS 2ND APPLICATION 4.5 LBS.
P-LOSS 2ND APPLICATION 28 LBS.
P-LOSS 5TH APPLICATION 37 LBS.
L-LOSS 5TH APPLICATION 12 LBS.
1ST APPL. P.
2ND APPL. P.
5TH APPL. P.
58 LBS. 1ST APPL.
80.5 LBS. 1ST APPL.
CYLINDER PRESSURE DIAGRAMS, 7TH CAR.

Fig. 22—Passenger Standing Demonstrations.

Pressure maintenance with schedule L and P equipments. Repeated emergency applications at short intervals.

It will be of interest to note the loss of maximum pressure of 24 lbs., which occurred between the first and second applications from 110 lbs. brake-pipe pressure with P equipment, and the final loss of 29½ lbs. between 1st and 5th applications, as against the loss of but 3 lbs. between the 1st and 2d application from 90 lbs. brake-pipe pressure and the final loss of but 8½ lbs. between the 1st and 5th applications with the L equipment.

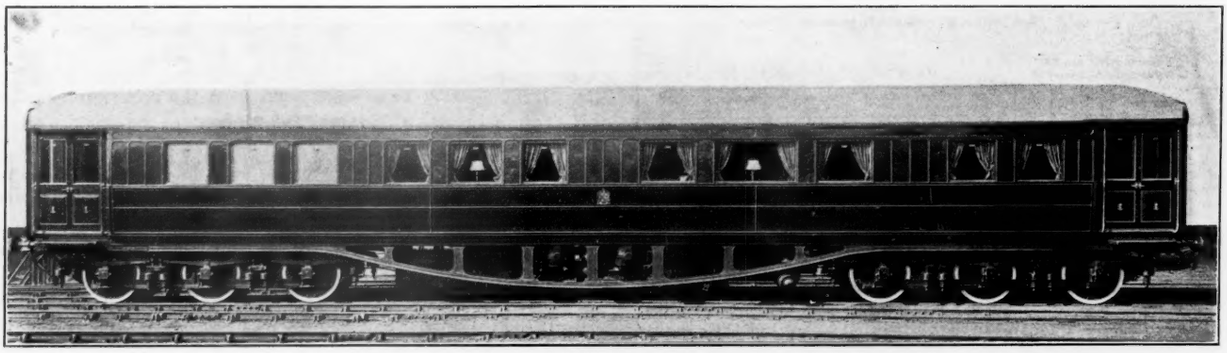
It will also be noted that the pressure from the first applica-

tion with the P triple valve was steadily reduced, as shown by the diagram, as against the uniform maintenance of pressures with all applications with the L triple.

(To be continued.)

A NEW ROYAL TRAIN.

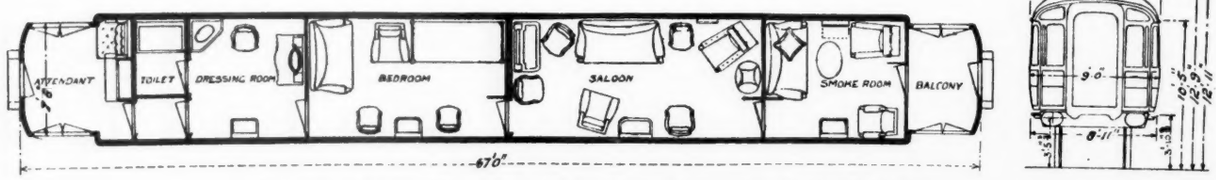
The London & North Western Railway recently built a very fine new train for the use of King Edward VII. when traveling on that system and on the West Coast Route between London and Balmoral. The railways comprising the East Coast Route have now also provided His Majesty with a royal train. The saloon, built at the Doncaster Works, is 67 ft. long over the body, 9 ft. wide by 12 ft. 11 in. high from the rail level to top of roof. It is built of teak, with a steel underframe, and is carried on two six-wheeled bogies. Entrance is made by double doors, opening inward, at each end; the mouldings around the panels and windows are of gilt brass, and the center of the bottom panels is ornamented with His Majesty's cipher. On each side of the doors are gilt grip handles, extending from the cornice to the floor. The outside panels are of specially selected figured teak and the center panel bears His Majesty's Coat of Arms. The roof is elliptical, and the outside appearance of the coach conforms generally to the standard type of the Great Northern and East Coast Joint Stock. The windows are of beveled plate glass and are balanced so that they can very easily be lowered or raised.

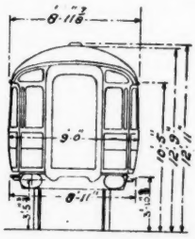


King Edward's New Saloon; London & North Western.

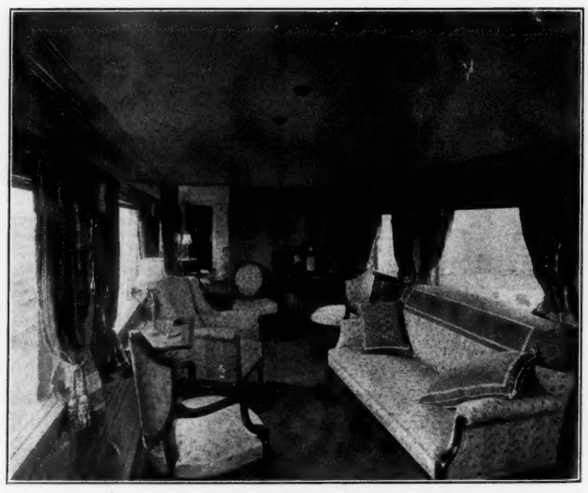
The saloon is divided into six compartments, consisting of an entrance balcony, a smoking room, a day saloon, a bedroom or dining room, a dressing room and an attendant's compartment. The balcony is panelled with richly figured teak and has a white paneled ceiling. The smoking room is 10 ft. long and decorated in Jacobean style; the walls are of oak inlaid with box-wood and dark pollard oak. The furniture consists of two arm-chairs and a large settee, upholstered in reindeer plush hide. The fittings are of oxidized silver. The day saloon, which is 17½ ft. long, is in Louis XVI. style, the walls being highly polished sycamore, inlaid with trellis lines of pewter and light mahogany. The furniture, which is of light French mahogany inlaid with pewter and box and upholstered with silk brocade, consists of two arm-chairs, a large settee and four smaller chairs. There is also a writing table which is fitted with adjustable shaded electric lights. The use of pewter is a revival of an old French method, which has a very pretty effect in conjunction with mahogany.

Both the day and smoking rooms are lighted by rows of tubular electric lamps, concealed behind the cornices on each side, giving a very soft and restful light. There are also corner brackets in the smoking room, and handsome gilt wall brackets in the day compartment, the lights in the latter being shaded with hand-painted silk screens. The bedroom, or dining room, is 14 ft. long, and the walls are paneled and enameled white; the furniture being in mahogany inlaid with kingwood, and covered with fine old rose colored silk damask with green silk embroidered cushions. When used for day journeys the bed is taken out and the compartment is converted into a dining room. The dressing room, which is 8 ft. long, is paneled and enameled white. Next to the dressing room is the lavatory, the floor of which is covered with inlaid cork parquet flooring and the walls are of fine Italian Cipolino marble cross-banded with white statuary marble. The attendant's compartment is fitted up





General Plan and End Elevation of Saloon; London & North Western.



Interior of Day Compartment.

with electrically-heated kettles, urns, etc., and a switchboard for controling the lighting and heating of the carriage.

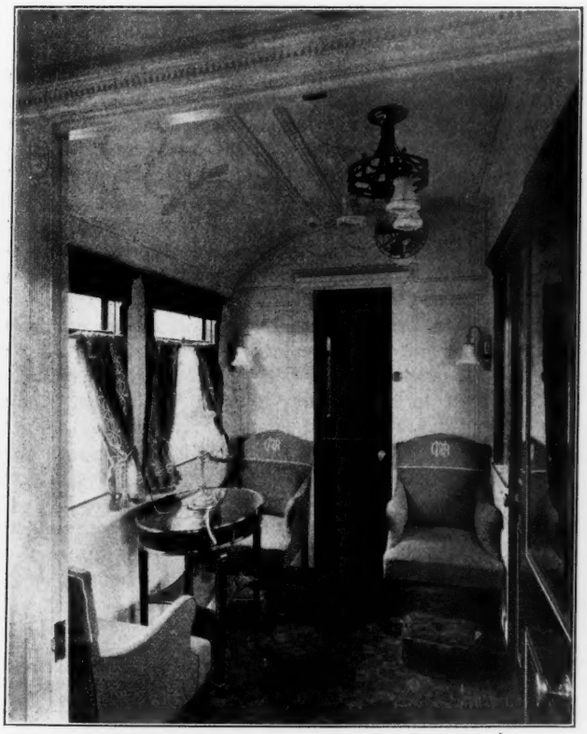
In order to give uniformity of effect, the whole of these rooms, with the exception of the attendant's compartment, are carpeted alike with a fine plain Saxony pile old rose carpet and all curtains and blinds are of soft green silk with white silk embroidery.

In addition to electric radiators, the saloon is heated with warmed air, which is delivered into the various com-

Dining, or Sleeping Room.

partments through ducts from electric blowers situated in the attendant's compartment. Ventilation is also afforded in the same way, and the air from the roof ventilators is extracted by electric exhausters. The decoration and furnishing have been carried out by Messrs. Waring & Gillow and Messrs. J. Stone & Co.'s system of lighting and ventilation has been used.

In addition to the saloon for His Majesty, King Edward VII., two special saloons have been provided for His Majesty's suite and friends, which are vestibuled on to the Royal saloon. These saloons are carried on four-wheeled bogies of special design with 10 ft. wheel base. The vehicles are 58 ft. 6 in. long and are fitted with easy chairs and couches upholstered in green tapestry. The partitions are so arranged that each of the saloons can be made into four bedrooms. The walls are enameled white, and the doors are of richly figured mahogany. All the electric fittings, electroliers, etc., are gilt, with white silk shades and of tasteful design. To complete the train, a saloon for Her Majesty, the Queen, has been built by the North Eastern Company at York, but the King's carriage and all the other vehicles on the train were built at the Doncaster Works of the Great Northern Railway.



Corner of Special Saloon; London & North Western.

RAILROAD ACCOUNTING AND THE HEPBURN LAW.

BY ARTHUR C. GRAVES, M.A.
New Haven, Conn.

The Hepburn Rate Law, as it is commonly called, which was finally adopted on June 29, 1906, was designed primarily to supersede and supplement the Interstate Commerce Act of 1887, particularly in the prohibition of rebating and discrimination. But the later act has taken on a far wider significance than a mere law aimed against rebating, owing to the attempts through that act to bring about the publicity and uniformity of railroad accounts and the wider range of powers given thereby to the Interstate Commerce Commission. Since its adoption, the Hepburn Law has been publicly commended and praised by politicians of the Republican party for what it has accomplished, not only for the shipper, in the prevention of unreasonable charges and rebating, but for what it has done in safeguarding the interests of the investor. Let us see what has been accomplished for the investor by this act in its provisions regarding railroad accounting.

There is no longer any dispute among right-minded persons that the policy of financial and corporate publicity is a principle to which no good or reasonable objection can be raised. It is, perhaps, the principal keynote in the serious problems of certain corporate reforms now confronting this country. Foremost among the reasons which have made this principle so essential is the ever wider distribution of corporate securities. Investors, then, are, of all persons, to be chiefly benefited by publicity. But, of course, there is a reasonable limit to be observed in our efforts to accomplish this object. Any steps taken to effect it must be reasonable and fair; they should never amount to any unnecessary restriction or hampering of the business affairs of the great transportation companies which carry our commerce. The legislation must, of course, be necessary. It is folly to place laws on the statute books which are either unnecessary or involve a great expense to no good purpose.

With these few observations let us notice before examining the provisions of the Hepburn act what the railroads have been doing in the way of financial publicity, and the development of their accounts. In brief, it was this: for ten years and more[1] the railroads of the United States have generally been giving to their stockholders and to the public by means of weekly and monthly statements and annual reports, very reliable and intelligent information of their most important financial and physical operations. To be sure, the practice of all companies has not been the same, particularly in reference to publishing weekly statements; but so far as the monthly and annual report is concerned, the same practice has long prevailed and very generally among all the large railroad sys-

[1] In some form or other railroads have been publishing periodic statements of earnings and annual reports for twenty-five years, and some individual companies, like the Pennsylvania, for fifty years. But the practice was not uniform nor by any means general. Furthermore, in the earlier days of the industry some of the newer railroads which were built up so rapidly were frequently charged and found guilty of manipulating their accounts. We, therefore, make no pretense of comparing the reports of those days with the trustworthy statements issued in recent years.

tems of the country. The weekly statement, perhaps the least important, simply shows the gross earnings of the railroad for one week, compared with those for the corresponding week of the previous year.

The monthly statement is an exhibit of their gross earnings, operating expenses and taxes, and the net earnings; some roads showing also in these statements the fixed charges and rentals and finally their net available income for the month. Some companies mail brief statements of each month's operations to their stockholders with comparisons with the corresponding month of the previous year.[2] Both the weekly and monthly statements, however, have always been given very wide publicity not only in the financial periodicals, but through many of our daily papers. In fact, every intelligent reader of the financial news of the day knows how common a sight these brief statements of the financial progress of our railroads are, as he glances through the daily paper. Indeed, they are so common that an explanation of them here is really unnecessary. They are simple, brief, and for their purpose, complete, and intelligible not alone to the financial student, but to every business man or investor. In the financial papers the monthly statement is set forth in a comparative form, showing the comparative results for the corresponding months of the preceding three years, side by side in parallel columns.

THE ANNUAL REPORT.

The science of railroad reporting, or the exhibit of the result of railroad operations, is as old as the industry itself, or nearly three-quarters of a century. The annual reporting of the American Railway System as a whole has a history of 20 years. The older individual companies have a series of reports running back to 50 and even 60 years.[3] It may be candidly said, not in derogation, but in commendation of the railroad industry, that the perfect annual report has never yet made its appearance, for the simple reason that it is always being perfected. It has never been determined just what the perfect report should contain and what it may omit to avoid prolixity. "Railroad accounting is in a transition state, as much so as locomotive building or track construction. Each day brings forth some new development. The business is never learned. Long service and study are necessary to comprehend the spirit and genius of the subject."[4] Then, too, it is strictly true that it is a very difficult task to present in an intelligible form the information which is desired. The compilation of a complete railroad report is a task of unusual magnitude. It is a science in itself, and understood by very few except those who, by experience, have gained some understanding and insight into the intricacy of railroad operations. It is one thing to operate the road and quite another to marshal all your facts and figures and arrange them in a concrete and concise form so as to intelligently inform others what the road has been doing.[5] But whatever may be its imperfections, the railroad annual report as we have it to-day in this country is one of the greatest accomplishments in the science of accounting, and perhaps the model of corporate financial publicity.

The annual report in general gives a full explanation of the company's financial and physical operations during the past year. It details more or less completely all changes in its capitalization, either by issuance of or retiring bonds or capital stock, together with a corporate balance sheet. The reports show in detail all sources from which the gross revenue is derived (freight, passenger, mail, express and miscellaneous) giving also operating expenses, taxes, net earnings, income from sources other than transportation, details of fixed charges, interest and rentals paid, and finally the net income available for dividends. Then come the dividends paid and other deductions, these other deductions usually being amounts which have been charged off for extraordinary improvements and betterments. The operating expenses are satisfactorily detailed under four main divisions, showing the cost of conducting transportation, maintenance of way and structures, maintenance of equipment and general expenses. Many reports also give to their readers the proportion which each one of these items of expense bears to the gross earnings, which proportion is sometimes of great significance in revealing the ability and conservatism, or otherwise, of the management. In many cases, too, all these items of the income account are given not only in gross, but are reduced to the "per mile" basis, until finally there is revealed to us what is known in the railroad world as the traffic density, the ton-mile revenue and the ton-mile cost. In simple language, the two latter mean the average rate for every ton of freight hauled one mile and the cost of hauling it. The statistics of the physical operations will reveal the number of passengers carried and tons of freight transported, and in a general way the movement of cars and trains, and all is reduced to some basic unit of energy or work performed and transportation service rendered.

The annual report further conveys intelligence as to changes in the physical property of the company with improvements and new constructions. Then, too, there is a more or less complete inventory of rolling stock and equipment, giving the tonnage capacity of cars and the tractive power of locomotives.[6]

Only in a very general way, at best, have we attempted to show the reader the vast amount of information which experience has shown is necessary to the complete railroad report and which is generally given, and the still greater labor involved in collecting, arranging and presenting such information. Nor let it be supposed that in this great array of statistics the railroad report fails to inform; for to the careful investigator not only are the operations of the past clearly shown, but even the future is to some degree revealed. Mr. Woodlock, in his book entitled, "The Anatomy of a Railroad Report," says, "It is simply impossible for trouble that could be foreseen to overtake a company without its having been clearly indicated in some department of its report should that be drawn up honestly and include the items herein referred to." Financial analyses which the investor frequently finds from time to time in our financial reviews often forecast with an accuracy which is quite remarkable the price movements of securities and dividend policies of boards of directors, the basis of such analyses being simply the information gleaned from the annual and monthly report. Even the private investor, with a little study and pains, can similarly work out for himself to a considerable degree the future of his investment so far as that may depend upon the honesty or wisdom of his company.

(To be continued.)

[2] The Illinois Central is perhaps the foremost example in this respect, having continued the practice of mailing monthly statements for considerably more than ten years. The Union Pacific Company, the Southern Pacific Company and some of the Gould lines are examples of this latter class. On the other hand, some of the Northwestern Grangers, as they are called, as the Northern Pacific, the Great Northern, the Chicago, Milwaukee & St. Paul and the Chicago & Northwestern, prior to the passage of the Hepburn Act, had in recent years issued no monthly statements of their net earnings. These latter, however, constitute almost the only exceptions among the well-known systems of the country. The New York Central and the other Vanderbilt lines, and also the New York, New Haven & Hartford R. R. publish quarterly statements of their comparative net earnings, but not monthly statements.

[3] For example, the Pennsylvania; the New York Central; New York, New Haven & Hartford; Delaware & Hudson; Delaware, Lackawanna & Western; Baltimore & Ohio; Illinois Central; Louisville & Nashville; Chicago, Burlington & Quincy, and others.

[4] Marshall M. Kirkman in "The Science of the Railways," "General Fiscal Affairs," Vol. X. p. 26.

[5] The Pennsylvania R. R. Co. concludes its fiscal year December 31. Its annual report, which has been often commended as one of the best and most complete types of the railroad report in this country, makes its appearance pretty regularly early in March. For a railroad company of the magnitude of the Pennsylvania, with its tremendous operations, to publish so informing and comprehensive a statement of its financial and physical performances in a little more than two months, is considered one of the notable achievements in corporate accounting.

[6] Many students of accounting criticise railroad reports as lacking in the information given as to the actual physical condition of the property and this point may be well taken. But this criticism is not so indicative of a spirit of unwillingness on the part of railroad managers as it is their inability to impart in an intelligible form the information desired. The purely financial position of the railroad, it is said, is sufficiently well covered by the reports of a majority of the companies.

General News Section.

It is reported that agents of E. H. Harriman have bought 50,000 acres of oil lands in the Tuxpan district. Oil has been discovered on property surrounding the entire tract.

On the New South Wales government railways only one passenger has been killed in a train accident in the past seven years, out of a total number carried of 258,620,836.

On December 8 the constitutionality of the Pennsylvania 2-cent fare law was again attacked in an equity suit filed in the court of common pleas at Pittsburgh by the Pittsburgh & Lake Erie and the Pittsburgh, McKeesport & Youghiogheny.

The City Club of New York has requested Mayor McClellan to appoint one or more bridge experts to examine the plans and stress sheets of the Manhattan bridge, in view of the defects found in the Queensboro (Blackwell's Island) bridge.

With the consent of the government, the Pennsylvania Railroad has placed an initial order for postage stamps perforated with the initials of the company. It is believed that this will check the use of stamps by employees for private purposes, and will also be of assistance in tracing lost mail.

Eighteen railway labor employment agencies that maintain offices at Minneapolis sent representatives to a recent meeting for the purpose of forming an association. Although the last fiscal year was not a favorable one, Minneapolis sent out through agencies close to 60,000 men for labor employment.

Among the elaborate Thanksgiving menus which have come to hand, that of the Chicago & North-Western is noteworthy for a loose leaf giving receipts for the special Thanksgiving dishes on the list. Nobody ought to try to eat more in one meal than the North-Western offered its patrons on Thanksgiving Day.

Hearings are being held on the proposal that the city of New York shall buy the so-called Steinway tunnel, running under the East river from Manhattan to Long Island City. The two difficulties with which the municipality is confronted are its debt limit and the question whether or not the franchise of the tunnel is valid.

A plan has been submitted to the officers of the Pennsylvania, which involves giving a serial number to each station on the road, and using a small indicator in the corner of passenger cars to show the next station at which the train stops. The inventor does not say how he is going to teach the passenger to remember the serial numbers.

Richard N. Johnson, a former chief despatcher on the Missouri, Kansas & Texas, has caused the arrest of William E. Brown, Division Superintendent of the company, for blacklisting. Johnson alleges that when he left the M., K. & T. to go to the Santa Fe Mr. Brown wrote a letter, the effect of which was to injure his chance of procuring and holding a position.

The annual report of the Isthmian Canal Commission shows that with the appropriations made by Congress for 1909, totaling $29,177,000, the grand total of all appropriations up to date has been $120,964,469. The total expenditures in the work thus far done were $84,572,999 at the close of the last fiscal year, and the balance available on the first day of the new fiscal year was $36,391,471.

Robert J. Bailey, secretary of the Individual Car Owners' Association, sends to private car owners notice of a meeting at the Hollenden Hotel, Cleveland, December 15, to revise the code of rules for use when private cars are repaired. Any private car owner who cannot be present at the meeting is invited to send suggested changes to the secretary, in typewriting, not later than December 10.

On December 2 the New York City Board of Aldermen passed an ordinance providing that none of the railways operating within the city shall use cars with flat wheels, loose trucks or defective gear; shall maintain any loose sagging or otherwise defective rail, switch or frog, which might be the means of causing unnecessary noise. It is provided that every violation of this section shall be punishable by a fine not to exceed $500.

The Premier of Alberta, Canada, has announced the establishment of a department of railways, with the object of assisting the promotion of the construction of railways throughout the province. The whole matter of railway construction will be taken in hand by the department, and promoters will be assisted by the granting of cash subsidies, somewhat on the lines now adopted by the Dominion.

At the annual dinner of the Illinois Manufacturers' Association, at Chicago, December 9, O. C. Barber, President of the Diamond Match Co., made a violent attack on railways, and said that shippers would never get fair treatment until the government organized the railways in one corporation with a government guarantee of 4 per cent. on the capital stock, and never afterward permitted an increase in capitalization.

The certificate of Attorney-General Bonaparte, requesting that the case of the United States government to compel the New York, New Haven & Hartford Railroad to relinquish its holdings of stock of the Boston & Maine Railroad be expedited, was granted December 4 by three judges of the United States Circuit Court, and the contention of the attorneys of the railway company, that the expediting act was unconstitutional, was overruled.

The New York Public Service Commission (New York City) has applied to the Board of Estimate for an appropriation of $987,000 for its expenses for 1909. This is $107,500 less than the Commission has cost the city this year. The Commissioners explain that they have in sight no such expensive investigations as those of the Metropolitan and Third Avenue railway systems. The salaries of the Commission, its counsel and secretary, are paid by the state, but the balance of its expenses have to be contributed by New York City.

A recent order of the Kentucky state courts directs the State Board of Valuation to assess the intangible property of the Southern Pacific, according to the constitution. The attorneys for the company contend that as the road has no track in Kentucky, the assessment should be nominal. For this reason the assessment of the intangible property has been at $1,000,000 for years. The new order would require an assessment of some $175,000,000. If the Supreme Court affirms the order the natural result will be that the company will pack its bag and find a home in some other state.

The appellate court at Ottawa, Ill., has affirmed the decision of the lower court in the case of the $100,000 judgment secured against Chicago by the Pittsburg, Cincinnati, Chicago & St. Louis as the result of damages to its property during the strike and rioting of 1894, made memorable by the clash of the federal authorities, represented by the late President Cleveland, and state authority championed by the late Governor Altgeld. The company brought suit against the city for $377,000 damages. The plaintiff took a change of venue from Cook county, and the case was tried in Du Page county, where in a trial lasting from May 1 to August 26, 1905, a verdict of $100,000 was returned in favor of the plaintiff.

Secretary Straus makes the following reference to the Anti-Trust Act in the annual report of the Department of Commerce and Labor: It is becoming more and more obvious that the work of the Government in regulating corporations should not be directed at the mere existence of combination itself, as such, but should deal rather with the way in which the combination powers are used, so as to prevent as far as possible the misuse of these great industrial forces. Only such combinations as are formed for wrongful purposes or such combinations as use their powers for evil should be brought under the condemnation of the law. It is useless to ignore the operation of the economic law that has brought about the present concentration in business. It is useless

to ignore the fact further that this concentration is already accomplished.

B. L. Winchell has sent a circular letter to the employees of the Rock Island system in which he says: "Our good old road is approaching her 58th birthday and is better and stronger than ever, and it seems to me a fitting time for everyone of us to resolve to make the coming year the best in its history." The anniversary letter is sent to the employees to bring them to a realization of the fact that they are parts of a great inter-related machine, which consists as much of themselves as of the stockholders and officers. The letter says that every man has a vital part to perform and urges that each of the 35,000 employees stand shoulder to shoulder, exercise care and economy and strive to please the road's master and the public.

A jury in the United States District Court at Salt Lake City on December 2 found the Union Pacific, the Union Pacific Coal Company, the Oregon Short Line, Everett Buckingham and J. M. Moore guilty of conspiracy in restraint of trade. The specific charge was that the defendants had conspired to cut off the supply of Wyoming coal going to David J. Sharp, a fuel dealer at Salt Lake City, because he advertised to sell coal below the prevailing price. It was alleged that their action drove Sharp out of business. Mr. Moore was Sales Agent of the coal company and Mr. Buckingham was General Superintendent of the Oregon Short Line. Mr. Moore assumed all responsibility for whatever was done against Mr. Sharp. He said that a low freight rate had been made to induce dealers to store large quantities of coal during warm weather and that Sharp's course in cutting prices nullified the purpose of the reduced rate. It was for this reason the coal company ceased to sell to him. The jury recommended Mr. Buckingham to the mercy of the court. Sentence was postponed, pending an appeal to the United States Circuit Court of Appeals.

The Illinois Manufacturers' Association has proposed a plan for dealing with the question of industrial switches in Chicago. It has adopted a recommendation that an ordinance be passed by the City Council providing "that a grant shall be made to every plant, factory, industry and warehouse needing the same, or in its proper application therefor, for a period of not less than 25 years, revocable only for good cause, without any compensation to the city, except that a reasonable fee shall be exacted sufficient to cover cost of keeping the records, inspection and supervision, and that the making of such grants be placed with some department or bureau of the city government, in order that the business may be transacted on a general plan without favoritism, unnecessary delay or charges which, especially to the small concern, may seem burdensome, while at the same time guarding carefully the rights of the streets and alleys crossed with all the necessary precautions for the public safety and convenience." It is said that there are now about 1,800 private switch tracks in Chicago owned by about 600 industrial concerns.

Railway Ticket Protective Bureau.

The Railway Ticket Protective Bureau has issued a circular letter telling of its recent work in suppressing ticket scalping through injunctional and other legal procedure. Ticket scalping recently has been suppressed at Cincinnati, Ohio; Columbus, Ohio; Toledo, Ohio; Denver; Omaha; El Paso, Tex., and Chicago, excepting that in Chicago three or four brokerage offices have managed to exist by manipulating party labor tickets, and a single broker at Toledo has carried on a small traffic in returned portions of week-end excursion tickets. Applications for injunctions against ticket brokers at Buffalo and Niagara Falls are pending in the Federal District Court. With the aid of the municipal authorities of Sandusky, Ohio, a considerable traffic in excursion tickets for summer travel to Put-in-Bay and Cedar Point was suppressed early in the season.

The bureau says that its second suppression of the brokers at Denver was accomplished only by exhausting the authority of federal, state and municipal courts and by tireless supervision of the offices of the brokers. Scalping at one time was entirely suppressed at Denver but was revived, and the bureau believes that it is entirely extirpated again. In the second campaign two professional ticket "raisers" and forgers were convicted and sent to the penitentiary. The bureau says in conclusion: "We find much satisfaction in announcing that the business of ticket scalping, as for many years systematically conducted in the principal commercial cities of the United States, has been decreased in the number of people engaged and in the volume of their transactions at least 95 per cent.; and, barring delays incident to legal procedure, in assuring the entire elimination of the fraternity within six or nine months."

The Pennsylvania's Timber Nursery.

The operations of the Pennsylvania Railroad Company's nursery for producing timber for railway purposes are interesting. On the company's farm of 70 acres, near Morrisville, Pa., the present nursery comprises about 13 acres. The soil consists of from 2 to 4 feet of sandy loam, underlaid with gravel. It would appear at first sight that this soil was already adapted to successful nursery work, but the commercial consideration fully justifies the method adopted of enriching this soil with 20 tons of stable manure, some specially chosen fertilizers and about 1,000 lbs. of hard wood ashes to the acre. With this preliminary enrichment, a growth from 10 to 20 times as rapid as under natural conditions can reasonably be expected. Also, rapid healthy growth produces a better quality of timber. Nuts from broadleaf trees were planted this year on about five acres. Two hundred and twenty bushels of red oak acorns, two bushels of pin oak acorns, 10 bushels of chestnuts, five bushels of walnuts and 150 bushels of hickory nuts were planted in rows 2 ft. apart. With losses deducted there are now living about a million and a half of seedlings from this planting. The company has also about 400,000 seedlings of the hardy catalpa and black locust. During the early years under such conditions we may reasonably expect a growth of from half an inch to an inch in diameter each year. This statement, however, is made by the writer and is not the estimate of the Pennsylvania Railroad Company's forester, E. A. Sterling, who will doubtless be glad to give detailed information to railway officers who write to him.

Rule for Commission Employees.

The Interstate Commerce Commission has issued an order that no employee of the commission may accept employment, either outside or inside of working hours, which involves the use of the commission's offices or records without specific permission from the head of his department; and that no employee may accept any employment from others which involves the use of the commission's offices or records while on his leave of absence from the commission. It had come to the knowledge of the commission that some of the employees were engaged in supplying outside parties with valuable information from the records.

Commutation Tickets on the Erie.

In consequence of a recent ruling of the Interstate Commerce Commission the Erie gave notice that its school commutation tickets would be withdrawn on December 17. The New York Public Service Commission then took the matter up and on November 23 addressed the railway company as follows:

"Your company has filed cancellation of its 46-trip school commutation ticket at all stations for traffic within this state. The commission learns from the newspapers that this action is taken in consequence of a ruling of the Interstate Commerce Commission. You are advised that the Public Service Commission has made no such ruling, but that it has ruled 'In the matter of reduced transportation rates to school children' that these school commutation tickets sold at reduced rates are legal. I send you a copy of the opinion rendered for the commission upon the subject.

"The provision of these commutation tickets confined to

the use of school children dates back so far in the past that its origin is practically unknown, and in the opinion of this commission their continued use is extremely desirable in the public interest. In so far as transportation of school children by the Erie Railroad within this state is concerned, you are advised that your proposed discontinuance of these reduced rates is not demanded under any construction of law, by this commission, which has sole jurisdiction of such transportation.

"Your very careful consideration of the advisability of abrogating the cancellation notice above mentioned is requested."

General Passenger Agent Wallace of the Erie says that the action taken by the company was due to the fact that a new commutation tariff was being filed with the Interstate Commerce Commission and that that commission refused to receive it with the school rates on the old basis. His letter states that the restoration of these tickets within the state of New York will be given careful consideration.

Bolivian Railway Concession.

On December 1 President Montes, of Bolivia, signed the law recently passed by the Bolivia Congress permitting modifications of the concession held by the Bolivian Railway with regard to new lines in the country, so that the Antofagasta & Bolivian Railway Company, Ltd., which is a British company, may guarantee the interest of the new lines from Oruro to Viacha, under an arrangement with James Speyer, made in London. The Oruro-Viacha line has just been built by an American syndicate. In addition to the interest guarantee, the Antofagasta & Bolivian company will make a payment to the syndicate for a large majority of the new line's stock. This important step towards combining the interests of the Antofagasta company with those of the American company is expected to result in the unification of the railway system of Bolivia in place of the free competition which the original laws contemplated.

Business Revival in the Northwest.

"Business has improved in the Northwest, and people there are making building plans for next year on a large scale. Things are moving forward all over the country, but it is not well to move forward too rapidly and we must not put too much on Brother Taft's shoulders at once. A good deal of work remains to be done. Mr. Taft cannot do it all. Several millions of people must co-operate in doing it.

"The Great Northern has 50 locomotives which have never had steam up. That shows how much equipment we're going to buy. For rails the demand will be greater, because there is sure to be new construction. But this new construction, whether in new roads or branches, is going to be carried on conservatively. Railway managers are going to look into propositions of new construction much more closely before they authorize extraordinary expenditures."—*J. J. Hill in New York Sun.*

Government Suit Against Anthracite Roads.

The suit of the Government, brought to dissolve the anthracite coal carrying roads' combination, a condition alleged to exist in violation of anti-trust laws, was resumed December 4, in New York City.

C. D. Simpson, formerly of the firm of Simpson & Watkins, owning one of the seven collieries alleged to have been sold to the Temple Iron & Coal Company and the coal carrying roads in combination, was on the stand to continue his testimony. He was examined by Mr. Warren, of the Temple Iron & Coal Company.

He said that no matter how great the capital he might have at his command, he would rather mine his coal and sell it to the present buyers than to attempt to market his own production. His profits, he thought, would be much greater.

E. L. Fuller, a retired coal operator from Scranton, Pa., testified that he had built several collieries and had been classed as an independent, but he had disposed of his interests to the combination now controlling the coal situation. As an independent, Mr. Fuller said, he had fixed his own prices. Mr. Fuller favored the sale of coal to the roads, as, he said, it gave the operators more for their coal.

"What is an independent operator?" asked Mr. McReynolds.

"An operator having no road of his own to carry out his coal," was Mr. Fuller's definition.

Pennsylvania Strike Averted Under Erdman Act.

An agreement was reached December 4 between Grand Chief Warren S. Stone and the general committee of adjustment of the Brotherhood of Locomotive Engineers and General Manager George L. Peck, of the Pennsylvania Lines West, in the controversy which arose between the engineers and the railway. The controversy was presented to Chairman Knapp, of the Interstate Commerce Commission, and Commissioner Neill, of the Bureau of Labor, acting as a mediation board under the Erdman Act.

Chairman Knapp and Commissioner Neill following the signing of the papers issued the following formal statement concerning the matters at issue and the agreement reached:

The locomotive engineers on the Pennsylvania Lines West of Pittsburg having applied to the undersigned under the provisions of the act approved June 1, 1908, commonly known as the Erdman law, to settle a pending controversy between them and the management of said lines, and our offer of mediation having been duly accepted by both parties, we have taken up with their representatives the matters in dispute and carefully considered the same. The facts of this controversy as developed by repeated conferences with the respective parties appear to be as follows:

The general committee of adjustment of engineers on said lines desired to present certain requests to the general manager and to discuss the same with him. The general manager declined to take up these requests with the committee on the ground that it is the settled rule of said lines that the general manager will not take up requests of employees unless they have been previously presented to and refused by the proper division superintendent and by the general superintendent in turn, and that the requests in question had not been presented to these subordinate officials in accordance with the rule mentioned.

The representatives of the engineers claim that most of the matters they desire to present to the general manager have already been submitted to the division and general superintendents as required by the practice of the company.

Upon examination of these requests as they were prepared for submission to the general manager, and after hearing the parties, it appears that some of the requests were presented to the division superintendents in December, 1907, in accordance with the rule; that an appeal was taken to the general superintendents and that arrangements were made for a further appeal to the general manager, but that it was later decided not to prosecute the same at that time. It also appears that some of the requests had not been previously presented to the subordinate officers.

In view of these facts, which are substantially conceded by both sides, we recommend that the committee eliminate from their petition to the general manager such requests as have not been submitted to the division superintendents and general superintendents, in accordance with the rule, and that if desired they be taken up in regular course with these subordinate officers.

As to the remaining requests: If the appeal taken on these matters in 1907 has been merely pending since that time it would be proper to hold that they have been through the regular channels and ought now to be taken up by the general manager with the committee. If, on the other hand, the appeal then made was abandoned or if in view of the time that has elapsed conditions have so changed that different action might now be taken by the division superintendents the general manager would be justified in requiring that the requests be again presented to the division superintendents and come to him only upon appeal in the regular manner.

Under these circumstances and in the absence of any understanding as to the time when an appeal from the decision of the subordinate officers ought to be taken it seems to us and

we recommend that the general manager should waive any question as to whether the appeal has been pending and should promptly meet with the committee and take up for settlement those matters that have in fact and substance been passed upon by the subordinate officers.

Moreover, in view of the fact that complications and friction have arisen and are extremely liable to arise in the future unless there is more definite understanding we recommend that a reasonable time be fixed within which any appeal to the general manager must be taken and also that a reasonable time be fixed within which subordinate officers shall pass upon requests presented to them.

Southern Commercial Congress.

The Southern Commercial Congress, with delegates representing sixty-four commercial organizations in fourteen southern states, assembled in Washington on December 8, unanimously passed the following resolution, expressing its attitude toward railways. It is noteworthy that Hoke Smith was chairman of the committee that drew up the resolution:

"Railway construction has been extensive, but the rapid commercial growth of the South requires an enormous increase in its railway facilities to transport to market its many and varied products. The construction of such adequate facilities can be accomplished only by assuring the holders of capital that such enterprises will be safeguarded by conservative and constructive legislation, and we urge upon our southern legislators the wisdom of such policy and condemn any agitation leading to the contrary.

"We favor a spirit of co-operation between the people and railways and other corporate interests, to the end that the required confidence of investors may be established in the securities of the corporations of the South."

Western Union Dividend Declared.

Directors of the Western Union Telegraph Co. have declared a quarterly dividend of three-quarters of 1 per cent. This is an increase of one-quarter of 1 per cent. quarterly and places the stock upon a 3 per cent. per annum basis. The dividend is payable January 15.

Panama Canal Bonds.

Bids for the new $30,000,000 issue of Panama Canal bonds were received by the Secretary of the Treasury from 834 bidders; only 159 of them were awarded bonds. The average price paid for the bonds was 102.4368. The bonds carry 2 per cent. interest.

New York and Albany Transportation Company.

Joseph H. Choate, Jr., has been appointed receiver for the New York & Albany Transportation Co. on application of G. P. Hudson, President of the company, who owns $105,000 bonds on which the interest has been defaulted. The company was incorporated in 1907 with $250,000 capital stock and $200,000 bonds, and it owns two steamers, the "Frank Jones" and the "Saratoga."

Railway-Set Forest Fires.

The reports to the New York Forest, Fish and Game Department from all the fire wardens and other men employed by the department in fighting fires during the year 1908, indicate that there were something over 700 fires, as against 82 fires reported in 1907. The total cost for fighting fires in 1908 will amount to about $138,000, as against about $6,771 in 1907.

The origin of the fires so far as information is obtainable is as follows: By bee hunters, 8; campers, 27; hunters, 95; fishermen, 18; smokers, 34; carelessness, 12; clearing land, 19; incendiary, 48; berry pickers, 12; by children, 6; from burning buildings, 1; accidental, 2; lightning, 9; blasting, 2; from railway locomotives (serious fires), 86, and over 300 incipient fires set by railway engines along the rights of way which were extinguished without serious damage by railway employees and the patrols put on by the department. Deducted from the total amount should be the eighteen fires that are reported as running from one town into another, and therefore undoubtedly twice reported.

Old Engine Given to Purdue.

The New York Central Lines have given to Purdue University for museum purposes an old Eddy engine, said to be the only one of its type in existence, built at Springfield, Mass., in 1876.

Number of Railway and Industrial Shareholders.

Statistics gathered from railway and industrial corporations in the United States having an aggregate outstanding capital stock of $5,846,051,973 show that this amount is now owned by 574,360 stockholders, whereas one year ago the same companies had $5,708,652,502 stock and only 507,361 holders. The average number of shares now owned by each railway stockholder is 119.02 shares, which compares with 136.93 a year ago, 167.79 just before the 1907 panic, and 188.55 in 1906. Industrial stockholders to-day carry an average of 88.30 shares, against 94.45 shares a year ago, 115.81 before the panic, and 126.44 in 1906.

The following table compiled from data received by the *Journal of Commerce* shows the total and average capitalization of the railway and industrial companies reporting the total and average number of stockholders and the average shareholders, together with 1907 comparisons covering the same concerns:

	1908.	1907.
Railways.		
Capital, 25 companies....	$3,000,248,157	$2,890,158,997
Average capital	120,009,926	115,606,360
Total No. stockholders....	252,083	211,069
Average No. per company.	10,083	8,443
Average holdings, shares..	119.02	136.93
Industrial Companies.		
Capital, 40 companies....	$2,845,803,816	$2,818,493,505
Average capital	71,145,095	70,462,337
Total No. stockholders....	322,277	296,292
Av. No. stockholders, pr Co	8,056	7,407
Average holdings, shares.	88.30	94.45

The total capital stock of United States railways, as computed by the Interstate Commerce Commission, was $6,800,000,000 in June, 1906, and since then there has been added, roughly, $700,000,000, giving a grand total of $7,500,000,000. If 40 per cent. of this capital be owned, as our figures prove, by fully 252,000 stockholders, it is fair to reckon that there are more than 600,000 holders of railway stock in this country. This is equal to 1 person in every 147 of the country's 88,000,000 population, although, of course, the same name may appear on the books of more than one company. One out of every 58 persons is employed on the railways.—*Journal of Commerce.*

It should be remembered that quite a proportion of these stocks may be held abroad.

New York Railroad Club.

The next meeting will be on Friday evening, December 18. It will take the form of a Christmas entertainment and social reunion, preceded by a brief business session. The programme will include a vaudeville entertainment and luncheon.

Proposed Amendment to Rate Law.

On December 8, Representative Townsend, of Michigan, introduced a bill amending in two important particulars the Rate law.

The most important of these amendments gives to the Commission directly the authority to suspend a complained-of rate pending an investigation. This provision would obviate the necessity of the complainant getting out an injunction against the road while he presented his case to the Commission.

The second amendment requires the roads to quote all rates in writing upon demand. Reparatory damages are to be adjudged by the Commission instead of by a court, as at present, and be collected by claim through the Commission. This

provision is intended to put a stop to endless litigation as to rates. The offending railway would be subject to a fine equal to the total amount of the rate involved.

St. Louis Railway Club.

The regular monthly meeting will be held in the Southern hotel on Friday evening, December 11. Samuel D. Webster will present a paper on "The Adjustment of Claims for Loss and Damage of Freight."

Traffic Club of Chicago.

The monthly meeting of the Traffic Club of Chicago was held at the Grand Pacific Hotel, on December 1, at 12.30 p.m. J. C. Lincoln, Commissioner of the Traffic Bureau of the Merchants' League of St. Louis and President of the National Industrial Traffic League, was the speaker.

Western Railway Club.

At the regular meeting on December 15 the first paper will be on "The Abuse of the Master Car Builders' Association Repair Card," by J. J. Hennessey, Master Car Builder of the Chicago, Milwaukee & St. Paul, and also Chairman of the Arbitration Committee of the Master Car Builders' Association. The second paper will be on "Life of Side Sheets of Wide Fireboxes," by C. A. Seley, Mechanical Engineer of the Chicago, Rock Island & Pacific.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; June, 1909.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Pl., New York; May, 1909; New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York; Jan. 12, 1909; New York.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—C. L. Young, C. & N.-W. Ry., Chicago, Ill.; May, 1909; Detroit, Mich.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; January; Montreal.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 62 Liberty St., New York; May, 1909; Louisville, Ky.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; June, 1909.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Iowa; 2d Friday in month, except July and August; Des Moines.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs. Jan., April, Aug. and Nov.; Atlanta.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The average total detention of cars in the territory of the Columbus Car Service Association was 1.68 days in October.

The number of cars loaded by the New York Central lines west of Buffalo, in November, was 807,151, a decrease of 15,582 over the same period last year.

Atlantic steamship lines have notified the railways that it is again their intention to pay commissions in connection with steerage steamer tickets for eastbound business.

Up to November 14, California had shipped 12,638 carloads of fresh fruit to the East this year. Up to November 14, 1907, the season's record of shipments was 7,401 carloads.

The Pennsylvania carried 13,323 passengers to the Army-Navy football game in its special trains for that event this year. This is an increase of 2,037 over the same figure for last year.

By agreement of counsel, the Chesapeake & Ohio Railway and W. R. Johnson & Co. pleaded guilty to rebating before Judge Waddill at Richmond, Va., December 4. The railway was fined $9,000 and W. R. Johnson & Co., $4,500.

On December 2, Judge Knappen, of the United States District Court, fined the Stearns Salt & Lumber Co., of Ludington, Mich., $10,000 for accepting rebates from the Pere Marquette on shipments from Ludington to Toledo. The Stearns company pleaded guilty on six counts.

M. S. Kohlberg, President of the California Commercial Association, has filed a complaint with the Interstate Commerce Commission against the advance in rates from the East to the Pacific Coast announced by Wells, Fargo & Co. (See page 1557 of this issue and November 27, 1908, page 1455.)

The Canadian Pacific does not intend to follow the Hill and Harriman roads and the Atchison in their obvious determination to give up without a strong fight their Oriental business. It placed in operation on December 4 a new export and import tariff which was almost identical with the domestic rates to the Coast.

The New England Navigation Co., controlled by the New York, New Haven & Hartford Railroad, now runs steamers daily between Boston and New York, in 15½ hours. These are the vessels of the Boston Merchants' Line, heretofore running less frequently and at lower speed. The boats start from either end of the route at 4.30 p. m.

The Pennsylvania has issued an additional circular including whiskey in the list of inflammables. The circular contains the following paragraph: "As whiskey and all other spirituous liquors will flash when tested at or below 100 deg., it has been decided that it belongs to inflammable liquids, and must therefore bear the red label in quantity exceeding five gallons."

R. P. Schwerin, Vice-President and Manager of the Harriman water lines, is quoted as saying that business on the water lines was never so bad as it is now, and that the company steamships out of San Francisco lost $468,000 last year, and for six months of the present year were run at a loss of $265,000. Also that it takes $100,000 to run a big trans-Pacific ship on a single round voyage.

As the result of an agreement with Dallas jobbers, the Missouri, Kansas & Texas on November 23 started its first package car out of that city. The car was loaded with goods which are to be distributed at points beyond San Antonio, and it is understood that if the experiment is successful, the Texas & Pacific will install a similar service, and the quick delivery of package service in that territory will be extended.

The Pacific Northeast Car Service Association reports a total car movement for October, 1908, of 92,956 cars, of which 94 per cent. were released within the free time. The total car movement from July 1 to September 30, 1908, as reported by this association, was 227,944, and the total car movement from July 1 to October 31, 1908, was 320,900. In the corresponding four months of 1907, the total movement reported was 323,603. Cars held overtime in July, August, September

and October, 1908, totaled 14,985 as against 18,051 during the same period last year.

The Baltimore & Ohio has inaugurated a new fast freight service from St. Louis to Philadelphia and New York. Trains will leave St. Louis at 2 o'clock p.m., and will run to New York in 63 hours and 30 minutes. The same train will make a schedule of 52 hours and 40 minutes from St. Louis to Philadelphia. Heretofore, it is stated, the fastest freight schedule between St. Louis and New York has been 76 hours. The reduction in time between these points is, therefore, 12 hours and 30 minutes.

The western lines are taking a vote on a proposition to make a round-trip rate of $62 from Chicago for the Alaska-Yukon-Pacific exposition at Seattle, Wash. It is also proposed to make a rate of $57.75 from St. Louis. The first date of sale will be May 25 and the last September 30, and the final return limit October 31. The transcontinental lines have already made a rate of $50 from St. Paul and Missouri river points. The proposed rates, like that already made, are one and one-half fare for the round trip.

R. P. Allen, Chairman of the Arkansas Railroad Commission, announced on December 3 that the Commission had decided not to make an order fixing rates to be collected while the reasonableness of the rates as already fixed is in litigation in the Federal Court. The jobbers of the state appealed to the Commission to fix rates higher than those the court enjoined it from enforcing but lower than those fixed by the railroads, but the Commission took the view that this action might prejudice its case in court.

The Erie has obtained from the United States Circuit Court, Judge Cross, a ruling to show cause why an injunction should not be issued against two barbers and two real estate dealers of Paterson, N. J., to prevent them from purchasing monthly non-transferable commutation tickets from Paterson to New York, and selling rides from them to the general public. The scheme of the alleged scalpers is to buy monthly tickets in names other than their own, and sell rides to their customers at about half the regular rate. The Erie claims that it is losing $750 a month at the Paterson station alone through this practice.

The Tehuantepec National Railway announces that it is now open for through freight business. A number of steamship lines maintain direct sailings from Puerto Mexico to New York, and to European ports; and also from Salina Cruz to ports on the west coast of America. Only half a day is required to carry freight across the isthmus. Large quantities of transcontinental freight have already been carried and delivered with despatch and in good condition. At the above named termini, which are on the Atlantic and the Pacific sides respectively, large docks and warehouses have been provided, sufficient to accommodate any amount of freight.

The traffic bureau of the San Francisco Merchants' Exchange has adopted a resolution stating that it will investigate the advance in freight rates to the Pacific coast that the transcontinental lines will make, effective January 1. It is expected that a complaint will be made to the Interstate Commerce Commission. Jobbers on the coast say that the new rates will put them at a relative disadvantage with jobbers in inland cities, and canners of fruits and vegetables express fear that the new eastbound rates will make it hard for them to sell goods in the Middle West. Meantime, business men at inland places, such as Salt Lake City, Spokane and Reno, Nev., are rejoicing over the proposed advances to the coast as a gain for them, and it is not improbable that, should the matter go to the Interstate Commerce Commission, the inland cities will file intervening petitions contending that the advances made in rates to the coast are justifiable.

It is said that A. M. Sutton, General Freight Agent of the American-Hawaiian Steamship Co., has announced at San Francisco that an immediate advance of ocean rates on commodities eastbound from the Pacific Coast will be made on January 1, or at the same time that an increase will be made in rates by the transcontinental railways. Mr. Sutton was quoted as saying that the advance would be about 5 cents per 100 lbs., which is considerably smaller than the advance to be made by the railways. There will be no increase in rates on hops, wines or wool; there will be slight advances on dried fruits, canned fruits and canned salmon. The advances by the steamship line, it is said, will be on substantially the same commodities as the advances made by the railways.

The Wisconsin Railway Commission, in its annual report to the governor of Wisconsin, asks for the following legislation: A law giving a utility still operating under a franchise granted before the enactment of the public utilities law, so-called, an opportunity to surrender the grant at any time in the future, and be granted an indeterminate permit. A law repealing all franchises or similar grants and giving in lieu thereof indeterminate permits. A law placing all electric, steam and highway crossings in Wisconsin under jurisdiction of the railway commission. An amendment to the law creating the railway commission to make that law conform with the so-called public utilities law, a later enactment, making it a punishable offense knowingly to ask for rebates or other special favor. A law giving the commission power to investigate the financial standing of companies that ask for certificates of public convenience and necessity to build lines of railway in Wisconsin.

Train service has been established on the Spokane, Portland & Seattle which, in connection with service on the Northern Pacific and the Chicago, Burlington & Quincy, has a schedule time from the East to Portland 8 hours and 45 minutes less than the former schedule of the Hill lines via Seattle. Burlington train No. 41, via Billings, arrives at Spokane at 4:35 p. m., making direct connection with a through train carrying standard Pullman and tourist sleeping cars, which leaves Spokane on the Northern Pacific at 4:45 p. m. daily. The train is operated from Spokane to Pasco over the Northern Pacific and thence to Portland over the line of the Spokane, Portland & Seattle. Passengers under this arrangement can leave St. Louis at 9:01 p. m. on Monday, for example, and arrive at Portland at 7:30 a. m. on the next Friday. It is stated that to meet this competition the Harriman lines will reduce by about five hours the time over their roads between Chicago and other eastern points and Portland.

G. J. Radley, General Manager of the California Traffic Association, has issued a statement in which he estimates that the increases in westbound freight rates to the Coast, announced by the transcontinental lines, will mean an increase of $10,000,000 in freight charges, at least one-half of which will have to be paid by shippers in California. He said that the increase in rates on eastbound shipments would mean an additional advance of $1,000,000 in freight charges. Continuing, Mr. Radley said: "The east-bound increase of about 10 cents a hundred pounds affects much of California's products, and amounts to $40 a car. We ship 5,000 cars of canned goods, 6,000 cars of raisins and dried fruits, 3,000 cars of prunes, 3,000 cars of beans, besides a lot of other products on which figures are hard to get, to all of which the railways propose to make the increase 10 cents a hundred pounds apply. The railways say the consumers pay the freight. This is true to a certain extent, but California products have hard sledding at best, and every effort should be made to increase their consumption. It may seem like a small matter when the railways say the increase is only one-tenth of a cent a pound, but it looks different when the producer has to take $40 a car less or lose the trade."

O. O. Calderhead, Secretary of the Railroad Commission of Washington, testified in the Commission's recent hearings, which were held with a view to determining what rates should be fixed on the basis of its valuation of railways, that commodities were hauled an average of 99 miles between points in Washington and the average rate paid is 29 cents per 100 lbs., while interstate shipments are hauled an average of 243 miles for an average rate of 26 cents. His figures, he said, were based upon information he had got from books of the railway companies at St. Paul, Minn. Among the average rates per ton per mile, state and interstate, that he gave are the following: Grain, state, 10.7 mills, interstate, 7 mills; lumber, state 13.5 mills, interstate, 4.7 mills; merchandise, less than carload, state, 6.5 cents, interstate, 2.2 cents. He said the average cost of hauling lumber and shingles per ton per mile, state, is 6.3 mills, and only 3.3 mills, interstate. The interstate haul on these commodities averaged about 1,400 miles, as against about one-third of that for state hauls. Other

costs given by Mr. Calderhead are as follows: Wheat per ton mile, state, 3.8 mills, interstate, 3.6 mills; general merchandise moving on less than carload rates, state, 3.4 mills, interstate, 1 cent. It is not stated on what bases Mr. Calderhead divided the various common expenses of transportation between freight and passenger and state and interstate traffic.

As stated in our issue of December 4, page 1495, the Post Office Department has ruled that the railways shall hereafter be paid monthly instead of quarterly for hauling the mails. The order to this effect has been issued by Joseph Stewart, Second Assistant Postmaster General, and will go into effect on January 1, 1909. On June 2, 1904, Henry C. Payne, Postmaster General, issued an order that for services rendered after July 1, 1904, the railways might be paid monthly; and at a conference in Washington on March 12, 1908, between James T. McCleary, then Second Assistant Postmaster General, and representatives of the railways, it was suggested by Mr. McCleary that the Department, in fairness to the roads, might put the order into effect, but some of the railway men present did not seem to accept the suggestion cordially, and, as some even opposed it, nothing further was done until Guy Adams, Supervisor of Mails of the Chicago, Rock Island & Pacific, brought the matter to the attention of F. A. Delano, President of the Wabash and President of the American Railway Association. Mr. Delano laid the matter before the executive committee of the association, and railway presidents in all parts of the country communicated to Mr. McCleary their views on the subject. Mr. McCleary subsequently resigned, and the matter was taken up with Mr. Stewart, his successor, and the order referred to resulted. While the rule for quarterly payments has been in effect the Department has been in possession on the average of as much as $6,000,000 that it has owed to the railways. Not only have payments been made only quarterly, but frequently the quarterly payment has been postponed until far into the month on the first day of which it became due. It has been calculated that the loss sustained by the railways through the withholding of this money was $1 per year for each mile of road over which the mails are hauled, this being about 200,000 miles.

INTERSTATE COMMERCE COMMISSION.

Difference in Commodities Justification for Difference in Rates.

William H. Anthony v. Philadelphia & Reading, et al. Opinion by Commissioner Harlan.

The complaint is that the defendants are unjustly discriminating against the agricultural interests of the state of Pennsylvania, by demanding extortion freight charges on agricultural products and at the same time providing low rates for manufactured articles. The specific complaint is that carloads of potatoes from points in the Harrisburg group in Pennsylvania to points in New York and New England are charged $3.40 per ton, while cement from the Harrisburg group is charged $2.25 per ton. The commission finds so many differences in the value of the product shipped and in the conditions of service that it cannot see any justification for basing one rate on the other, and the complaint is therefore dismissed.

Reduced Rate When Smaller Cars Are Furnished.

Carstens Packing Co. v. Northern Pacific, et al. Opinion by Commissioner Lane.

Complainant shipped 20 carloads of cattle from Anaconda, Mont., to Tacoma, Wash., the rate being $110 per 36-ft. 6-in. car. Complainant ordered 36-ft. equipment, but two of the cars furnished were only 34 ft. in length. There was a provision that if the cars furnished were longer than 36 ft. 6 in. an additional charge of 3½ per cent. for each additional foot, or fraction thereof, was to be made, but no provision for a corresponding reduction for cars of shorter length. It is possible to load on the average about 25 head of cattle in a 36-ft. car and only about 23 head of cattle in a 34-ft. car. The defendants have since the date of the shipment amended their tariff so that a reduction of 3½ per cent. per foot is allowed for cars less than 36 ft. 6 in., and reparation should be made accordingly to the complainant for the charge of $110 per car on the two cars 34 ft. long.

Not Forced to Meet Competitive Rate.

East St. Louis Walnut Co. v. Chicago, Rock Island & Pacific, et al. Opinion by Commissioner Lane.

Complaint is made that the 16-cent rate on walnut logs in carloads from Jacksonport, Ark., to St. Louis, Mo., and the 17½-cent rate to East St. Louis are unreasonable. Jacksonport is on the White river and is four miles from Newport, which is a junction of the St. Louis, Iron Mountain & Southern and the St. Louis & San Francisco. By the Iron Mountain the distance from Newport to St. Louis is 265 miles, while by the Rock Island route the distance from Newport to St. Louis is 425 miles. At the time of this complaint, the same complainant filed a petition against the St. Louis, Iron Mountain & Southern and the Missouri Pacific. These lines admitted the unreasonableness of the 17½-cent rate and offered to make a rate of 11½ cents from Newport to East St. Louis, which rate the commission has ordered. Previous to 1907, the Rock Island lines had made the same rate, namely, 11½ cents, to East St. Louis as the Iron Mountain-Missouri Pacific rate. In March of that year the Iron Mountain increased its rate to 17½ cents, and in July the Rock Island made the same increase. The Rock Island, therefore, met the increase but has not met the decrease made by the Iron Mountain. Obviously, if walnut logs are to be shipped from Jacksonport to East St. Louis via the Rock Island, it will be necessary for the defendants to make the same rate as that made by the Iron Mountain, notwithstanding a difference of 160 miles in haul. We do not feel legally justified, however, in requiring the defendants to meet the rate of the Iron Mountain, although they may do this voluntarily, and there are moral conditions which should impel to such a course.

It should, however, be borne in mind that this particular product is an extremely low grade of freight. The logs shipped are known as culls, which are only fit to be used in the manufacture of articles requiring very short lengths, such as gun stocks. In consideration of this, the rate over the Rock Island should be reduced to 14½ cents to East St. Louis and 13 cents to St. Louis as a maximum on walnut logs in carloads, and reparation is accordingly awarded.

Rating Upon Basis of Value.

Union Pacific Tea Co. v. Pennsylvania et al. Opinion by Commissioner Prouty.

The complainant gives away large quantities of china and crockery as premiums, using mainly the cheaper grades of German and Austrian china, which it buys from the importer in New York and repacks at its warehouse and ships in comparatively small packages to its various subsidiary stores.

Earthenware or crockery is classified under official classification at 20 per cent. less than third class L.C.L., whatever the form of package. Chinaware, in the same classification, is first class in boxes and second class in casks. The chinaware handled by the complainant is of the cheapest grade and not of much higher value than the cheapest grade of crockery, and the complainant asks that chinaware of this grade be given the same rate as crockery. We are of the opinion that there is a well defined distinction between earthenware and china, and that the carrier may, if each of these commodities is to be treated in a class as a whole, properly impose a somewhat higher rate upon china than on earthenware. The complainant asks that chinaware not exceeding in value $12 per hundred pounds shall be given the same rate now given to crockery. The same consideration which would lead to fixing the rate of transportation by value in the case of these commodities will apply with equal force to many other commodities. While we now decline to establish this rating upon the basis of value, it must not be understood that we have reached a final conclusion that such a principle might not with propriety be introduced into the classification of these articles. There is much to commend the idea. If the carriers could suggest a workable plan which would accomplish this classification of china by value, it would probably meet with the approval of the commission.

The value contemplated by such a classification would not be a released value but a declared value. Any misstatement of the value by the shipper would constitute a false representation or false billing and would subject the shipper to heavy penalties. We think that this suggestion may well receive a careful consideration from carriers.

The different rates on china shipped in barrels and that shipped in boxes does not seem to be reasonable, and china in all forms should be put in the second class. The effective date of this order, however, will be postponed until February 1, 1909. If the carriers decide to propose an amended classification of crockery and chinaware they may at any time apply to the commission for a modification or annulment of this order.

Raising Locals to Make Sum Equal Through Rate.

R. A. Sylvester v. Pennsylvania, et al. Opinion by Commissioner Lane.

On April 18, 1908, the rate on oranges from McIntosh, Fla., to Pottsville, Pa., was 76.3 cents per box. The sum of the local rates between these points was 71.3 cents. About this time the complainant shipped oranges to Pottsville, and asks that it be awarded reparation to the extent of five cents per box, this being the difference between the sum of the locals and the through rate paid. It appears that the carriers make a comparatively low rate from Jacksonville to Philadelphia to meet water competition, and they contend that the interior points are not entitled to as low an adjustment of rates. The rate to Reading, an interior Pennsylvania point west of Philadelphia, was the same as the rate to Florida, probably because the rate was established years ago when the long and short haul clause was construed literally. When this complaint was brought, there were two ways of eliminating the discrimination against Pottsville. One was to reduce the Pottsville rate to an amount equal to the sum of the locals; the other was to raise one of the locals. The defendants raised the local rate. Since the question of rates on oranges from points of production to northern deliveries is involved in another case now before the commission, we do not feel justified in ordering a reduction of the through rate to an amount equal to what was the sum of the locals at the time the shipment moved; nevertheless, the complainant should be awarded reparation for shipments made at the time the lower local rates were in force.

STATE COMMISSIONS.

The Railroad Commission of Louisiana has ordered the Pacific Express Co. to establish express service on the Natchez & Western.

The Railroad Commission of Louisiana has fined the Louisiana & Northwest $100 for alleged violation of the Commission's rule prohibiting a road from removing or abandoning a switch or spur without the Commission's consent.

The Railroad Commission of Louisiana has ordered that rates on sugar cane for planting purposes shall be the same as mileage rates on sugar cane for manufacturing purposes, without any requirement that the product be reshipped by the line transporting the cane for this purpose.

The New York Public Service Commission, Second district, in denying the petition of the Rutland to discontinue Forest station in the town of Altoona, expresses its disapproval of the practice of station abandonment solely because of small revenue returns. The commission holds that it is bad business policy for a railroad to abandon a station in a struggling community because that station does not pay for itself. The general revenue of the road should be used to help pay the expenses of such a station.

The Kansas Board of Railroad Commissioners has asked the railways, through their legal departments, to instruct their employees to stop the drinking of liquor on trains in Kansas. The Commission also asks that cuspidors be furnished in all passenger cars for users of tobacco, and that the practice, which is said to prevail on some lines, of sweeping out cars when they are occupied by passengers, shall be stopped. The Commission states that unless its suggestions are complied with within 30 days it will instruct its attorney to file a complaint in the premises.

The Louisiana Railroad Commission has issued an order to the steamers St. James, Mabel Comeaux, Imperial, William Garig, America, Columbia and the Steamboat Traffic Association to show cause why each of these boats and the Traffic Association should not be fined for refusing to accept cotton at Plaquemine for shipment to New Orleans at 50 cents per bale, the rate maintained by the railways. The Commission has an order requiring steamboats to carry freight at railway rates at competitive points. The steamboats maintain they cannot carry cotton for less than 75 cents a bale. The case will be heard Dec. 16.

The Railroad Commission of Louisiana has fixed the following maximum express rates to be charged by Wells, Fargo & Co., the Southern and the Pacific Express Companies between Monroe, La., and other points in the state after December 1 on packages weighing under 100 lbs.: Twenty miles and less, 40c.; 30 miles and over 20, 45c.; 50 miles and over 30, 50c.; 70 miles and over 50, 60c.; 100 miles and over 70, 75c.; 120 miles and over 100, 80c.; 150 miles and over 120, 90c.; 175 miles and over 150, $1; over 175 miles, $1.75. The joint through rate on any shipment moving over the lines of more than one company shall not exceed a sum equal to 90 per cent. of the sum of the minimum charge of each line.

The Long and Short Haul Clause in Kentucky.

The Kentucky Railroad Commission on November 24 issued an order exempting every shipping point in the state from the long and short haul clause in the Kentucky statutes. The Louisville Board of Trade has sought such an order for 10 years. E. W. Hines appeared for the Board of Trade on November 24 and made an argument in which he sought to show that owing to the enforcement of the long and short haul law, jobbers and other business men in cities outside of the state were able to compete at a great advantage for business in Kentucky against jobbers and other business men within the state. Among the places whose business men were said to have an advantage over those of Louisville are Cincinnati, Evansville, Nashville, Chattanooga, Knoxville and St. Louis. C. B. Compton, Freight Traffic Manager of the Louisville & Nashville, said that so long as the long and short haul law was enforced it would be impossible for the railways to give shippers within Kentucky as good a basis of rates as interstate shippers. The order of the Commission becomes effective at once.

Excess Baggage Rates Based on Mileage.

The Michigan Railroad Commission has submitted to the railways of the state a proposition to base excess baggage rates on mileage. Heretofore these rates have been a certain percentage of the passenger's fare, the percentage being larger in proportion as the fare was smaller. The schedule of charges submitted by the Commission for the consideration of the roads is as follows:

Miles.	Charge.*	Miles.	Charge.*	Miles.	Charge.*
1 to 10..	6 cts.	111 to 120..	40 cts.	211 to 220..	73 cts.
11 " 20..	8 "	121 " 130..	43 "	221 " 230..	77 "
21 " 35..	12 "	131 " 140..	47 "	231 " 240..	80 "
36 " 50..	15 "	141 " 150..	50 "	241 " 250..	83 "
51 " 60..	19 "	151 " 160..	53 "	251 " 260..	87 "
61 " 70..	23 "	161 " 170..	57 "	261 " 270..	90 "
71 " 80..	26 "	171 " 180..	60 "	271 " 280..	93 "
81 " 90..	30 "	181 " 190..	63 "	281 " 290..	97 "
91 " 100..	34 "	191 " 200..	67 "	291 " 300..	$1
101 " 110..	37 "	201 " 210..	70 "		

Example:

3 runs of	8	miles	each	at	6	cts.	per	1,000 lbs.	$1,80
2 "	" 12	"	"	"	8	"	"	1,000 "	1.60
1 "	" 24	"	"	"	12	"	"	1,000 "	1.20

*Charge, per 100 lbs., for excess baggage.

Additional distances in the same proportion.

Where the actual mileage is less than 5 miles in excess of the minimum stated, the minimum mileage shall be used. Where the actual mileage is 5 miles, or more than the minimum stated, the maximum mileage shall be used.

Minimum Charges.—No excess charge less than 25 cents will be made when the gross weight of the excess baggage is less than 200 lbs., and no charge less than 35 cents will be made when the gross weight is over 200 lbs. and less than 300, and no charge less than 50 cents will be made when the gross weight is over 300 lbs. and less than 500 lbs.

Indiana.—Interchange of Cars Between Steam and Electric Roads.

Winona Interurban Railway v. Cleveland, Cincinnati, Chicago & St. Louis. Opinion by Chairman Hunt.

The complainant, an electric railway company doing an interurban business, seeks to compel the defendant, a steam railway, to exchange cars at Warsaw. The traffic is in carload lots, and there is a physical connection between the roads of the complainant and defendant. The defendant argues that if compelled to deliver traffic in carload lots to the complainant by turning over its (defendant's) cars, the rolling stock of the defendant will be used in interurban business and will not be promptly returned. The commission holds that it can remedy this by orders if necessary, and decides that where a physical connection exists between an electric road and a steam road, the latter must turn over carload freight to the electric road.

Nebraska.—Differentials on Inbound and Outbound Shipments.

Chicago Lumber Co., et al., v. Chicago, Burlington & Quincy, et al.

The complainant asks that the rate on lumber to all points in Nebraska from Omaha be reduced to the same rate that applies from Lincoln. There is nothing to show that the rates from Omaha are unreasonable *per se*. The burden of the complainant's argument rested on the recent decision of the Interstate Commerce Commission, whereby the differential in favor of Omaha on lumber shipments for the south as against Lincoln, an intermediate station between the southern lumber supply points and Omaha, was declared unreasonable and Lincoln given the same rate as Omaha. Complainant argued that the differential in favor of Omaha on the old inbound rate was offset by a varying differential in favor of Lincoln on outbound rates, and that the wiping out of the differential on inbound rates from the southern pine territory, and the maintenance of the old and present differentials on outbound shipments in favor of Lincoln, would result in the destruction of Omaha as a wholesale market for southern lumber. To grant the prayer of the complainant would not only unsettle distributing rates on lumber from Omaha and Lincoln, but would open up the question of jobbing rates on all other commodities from the several wholesale centers of the state. The commission has this matter under consideration on a question of class rates, and, moreover, the commission cannot at present establish the precedent that all towns and cities receiving the same inbound rates on any commodity should enjoy the common out-rate to all points in the state, regardless of distance, or the justice of such rates. The complaint is therefore dismissed.

North Central Association of Railway Commissioners.

The railway commissioners of Ohio, Indiana, Michigan, Illinois and Wisconsin met in Chicago on December 2 and 3 and formed a permanent organization, to be known as the North Central Association of Railway Commissioners. The following officers were elected for two years: President, C. L. Glasgow, Chairman Michigan Railroad Commission; Vice-President, W. H. Boys, Chairman Railroad Commission of Illinois; Secretary William Kilpatrick, Secretary Railroad Commission of Illinois.

The object of the association is stated to be to consider matters of mutual interest to the Commissions and the public. All future meetings will be held in Chicago and will be subject to call by the President. Other Commissions will be admitted to membership on application to the President.

A meeting of members of the Commissions forming the new association was held in Chicago on June 12 and 13, 1908, and committees were appointed to prepare reports on Grade Crossings and on Trespassing on the Railways. These committees submitted reports at the meeting on December 3, which were adopted.

The Committee on Grade Crossings was composed of J. C. Morris (Ohio), W. J. Wood (Indiana), B. A. Eckhart (Illinois), George W. Dickinson (Michigan), J. M. Winterbotham (Wisconsin). This committee in its report said that the main obstacle to the elimination of crossings of railways with highways and with other railways, is the expense involved. Railways, states, counties, cities and villages alike are responsible for the existence of grade crossings. Reference was made to the legislation of different states under which the expense of separating grades is divided between railways and the state, county or municipality, and especially to the laws in some of the eastern states, which require a certain number of grade crossings to be eliminated annually. In New Hampshire, where there are but 1,190 miles of road, it was stated that within 16 years 376 dangerous crossings have been abolished at a total cost of $24,310,000. This includes elevation of tracks in some instances. In New Hampshire the railways pay 65 per cent. of the cost of eliminating grade crossings and the state and municipality 35 per cent. In New York about $260,000 a year is paid from the state treasury for this purpose. The committee said that legislation should be secured which would not put too much of a burden on either the railways or the public. Railway commissions should be clothed with power to hear and determine applications for the separation of grades and to divide the expense within certain limits. Where a street or highway is occupied by an electric line it should be made to bear its fair part of the expense. Commissioners at the time of determining the necessity of abolishing grade crossings should apportion the cost. The apportionment should not be upon any fixed basis, as the proportions of the benefit derived from such changes are not always the same. State commissions, the committee said, are best fitted to divide the expense, because they are removed from local influences and have the knowledge and experience needed for fair action. The committee thought that legislation should be adopted in the various states to prohibit the construction of any grade crossings in future.

The committee on Trespassing on the Railroads, which was composed of W. J. Wood (Indiana), O. H. Hughes (Ohio), and J. H. Willoughby (Illinois), referred to the fact that about 50 per cent. of the people killed annually on the railways of the United States are killed while trespassing on railway property. It said that as the state supervises and regulates the tolls of these highways, it seems to be its duty also to protect the companies, which it has invested with a part of its own sovereignty against trespassers. The committee favored the passage of statutes making it unlawful "to walk upon, or stand upon, or go upon railway tracks or bridges, except at such crossings and places as the public have a right to use." Railroad commissions are urged actively to insist on legislation such as that indicated. The committee said it anticipated there would be difficulty in enforcing such laws, and it suggested that police power might be given to section foremen as it is now given to train conductors. The committee recommended that the proposed law should require the railways to post the act prohibiting trespassing in all their stations and places where the public is accustomed to use their tracks.

Conference of Shippers and Railway Officers Not Held.

It was expected that a conference between representatives of shippers and railways in eastern territory regarding advances in freight rates would be held in Chicago on November 8, but owing to the fact that most of the railway men who were expected to participate in the conference wrote that they could not attend, it was not held. The committee of shippers was appointed by F. W. Upham, of Chicago, chairman of a general committee of fifteen men, appointed by the shipping interests at a meeting in Chicago on May 15, 1908. The resolutions under which this so-called "Committee of 15" was appointed stated that the shippers were opposed to any advance whatever in freight rates; suggested that the entire matter be submitted to the Interstate Commerce Commission; declared that if the carriers, without accepting this proposition, raised any rates, shippers should appeal against their action to the courts, and gave the Committee of 15 "full power and authority to carry these resolutions into effect." Certain shippers, among them representatives of the Chicago Association of Commerce, contended that under these resolutions the Committee of 15 had no authority to do anything but oppose any advance in rates whatever. Nevertheless, a sub-

committee of shippers, composed of Mr. Upham, E. H. Gary, New York; C. I. Pierce, Chicago; Alfred Brandeis, Louisville; U. G. Orendorff, Canton, Ill.; Marshall Hall, New York, and Charles G. Ross, Brooklyn, was named to confer with a committee of railway officers with a view, it was stated by Mr. Upham, to making some kind of a compromise. The committee for the railways, it was stated, was to be composed of W. C. Brown, New York Central; J. B. Thayer, Pennsylvania Railroad; F. A. Delano, Wabash; H. B. Chamberlain, Erie; William Cotter, Pere Marquette, and G. F. Randolph, Baltimore & Ohio. Messrs. Thayer, Delano, Cotter and Randolph, who wrote that they would not attend, did not state whether they did this because some prominent shippers had publicly questioned the power of the committee, headed by Mr. Upham, to reach any understanding, whereby the railways would be allowed to make advances in rates without opposition from shippers, but it is probable this had something to do with the matter, for the conference, obviously, would have been apt to be fruitless after part of the interested shippers had announced that they would not abide by its results unless the railways acceded to the demands made by the shippers' convention last May.

Chefoo-Weihsien Railway.

Chinese interests have been given authority by the Peking authorities to build the Chefoo-Weihsien Railway. Money is on hand to build from Chefoo to Whanghsien, and probably on to Laichowfu. This railway is a plan of Chefoo merchants to regain trade for that port, mainly straw braid, which the Shantung Railway has recently diverted to the port of Tsingtau. It is said that work will commence at once.—*Consular Report.*

Freight Car Balance and Performance.

Arthur Hale, Chairman Committee on Car Efficiency of the American Railway Association, in presenting statistical bulletin No. 34, covering car balance and performance for June, 1908, says:

"As reported in Bulletin No. 25-A, there was a considerable decrease in the number of surplus cars, the average for June being 331,646, or 15.86 per cent. of the total, as against 393,219, or 18.32 per cent. of the total cars on all lines during May. The shop cars increased from 8.98 per cent. in May to 9.69 per cent. in June, an increase of 14,846 cars. Adding the surplus cars to the shop cars and deducting 5.02 per cent. as the normal percentage of shop cars, we secure 20.53 per cent. as the amount of reduction to apply to the total cars in order to secure an average for the cars actually in use, for comparison with reports for previous periods.

"The following table shows the performance computed on the above basis as compared with those averages that include cars temporarily non-productive:

	Average miles per day.		Average ton-miles per car per day.		Average earnings per car per day.	
	Inc. surp.	Exc. surp.	Inc. surp.	Exc. surp.	Inc. surp.	Exc. surp.
	cars.	cars.	cars.	cars.	cars.	cars.
December, 1907	21.9	23.9	289	316	$1.98	$2.17
January, 1908	20.8	24.9	277	325	1.81	2.17
February, 1908	19.7	23.8	271	328	1.82	2.20
March, 1908	21.2	25.5	290	348	1.95	2.34
April, 1908	19.6	24.5	258	324	1.83	2.29
May, 1908	19.3	24.8	254	329	1.72	2.22
June, 1908	19.6	24.7	276	347	1.88	2.37

"The car balance percentages are unchanged from those in the May report, the number of cars on their home lines remaining at 78 per cent. of the total ownership. Evidence of a partial return to normal conditions of car interchange is noted in the slight increases in the foreign cars in Groups 1 (New England), and 9 (Southwestern), in which groups the normal excess of cars had been materially reduced since November, 1907. The per cent. of loaded mileage shows a continued improvement, and in June was only a few points below normal. The loading per car also shows considerable increase, and the combined effect of the improvement in these two items is shown in the ton miles per car per day, and the earnings per car on line, both of which increased in much greater proportion than the average miles per car per day."

The accompanying table shows freight car balance and performance by groups for the period covered by the report.

Freight Car Balance and Performance in June, 1908.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Okla., Ind. T., Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	71,361	670,833	280,458	135,196	175,173	368,749	15,801	137,980	26,560	112,620	96,342	2,091,073
Average number system cars on line	56,499	502,543	237,105	101,807	135,581	305,582	6,545	109,653	16,801	67,259	81,044	1,620,479
Railroad-owned cars: Av. foreign on line	22,201	137,082	56,898	21,182	29,918	60,481	9,437	26,222	14,265	38,311	12,496	428,493
Total cars on line	78,700	639,625	294,063	122,989	165,499	366,063	15,982	135,875	31,066	105,570	93,540	2,048,972
Excess	7,339	.....	13,605	.....	.....	.....	181	.....	4,506	.....	.....	.....
Per cent. cars on line to total owned:												
Home		79	75	85	75	77	83	41	63	60	84	78
Foreign		31	20	20	16	17	16	60	54	34	13	20
All railroads owned	110	95	105	91	94	99	101	98	117	94	97	98
Private cars on line	2,179	36,096	13,452	3,009	6,996	12,171	1,098	8,511	2,266	10,106	4,083	99,967
Total, all cars on line	80,879	675,721	307,515	125,998	172,495	378,234	17,080	144,386	33,332	115,676	97,623	2,148,939
Per cent. of cars in shop	9.33	10.31	9.97	9.16	8.98	6.52	8.64	16.65	6.08	8.38	8.71	9.69
No. of freight engines owned	1,133	9,901	3,780	2,237	2,582	6,280	450	2,537	672	2,326	2,083	33,981
Av. cars on line per freight engine owned	71	68	81	56	67	60	38	57	50	50	47	63
Total freight-car mileage	38,138,592	411,630,170	154,695,566	74,036,297	101,868,502	212,572,554	19,480,422	74,169,647	22,531,610	84,710,560	63,624,852	1,257,458,772
Average miles per car per day	15.7	20.3	16.8	19.6	19.7	18.8	38.0	17.9	22.5	24.4	21.8	19.6
Per cent. loaded mileage	69.9	65.2	63.9	64.6	68.7	72.3	75.4	69.1	67.7	72.0	73.8	67.9
Ton-miles of freight, Inc. Co. freight	407,044,160	6,124,635,296	2,176,419,713	920,217,399	1,289,427,870	1,747,187,507	310,547,152	936,832,408	199,862,806	1,236,143,528	790,614,031	16,138,931,870
Average ton-miles, including Co. freight:												
Per car-mile	10.7	14.9	15.1	12.4	13.7	12.6	16.4	12.6	10.9	14.6	12.4	13.9
Per loaded car-mile	15.3	22.8	23.7	19.2	17.9	17.9	21.7	18.5	16.0	20.3	16.8	20.6
Per car per day	168	302	261	243	271	248	648	225	230	357	270	276
Gross freight earnings	$4,549,686	$38,613,238	$12,789,559	$6,533,246	$8,032,572	$15,457,133	$2,416,681	$7,966,956	$2,005,251	$11,263,763	$5,923,959	$115,551,144
Average daily earnings: Per car owned	$2.13	$1.92	$1.52	$1.61	$1.66	$1.81	$3.10	$1.93	$2.51	$3.34	$2.05	$1.93
Per railroad-owned car on line	1.93	2.01	1.45	1.77	1.76	1.85	5.04	1.96	2.15	3.57	2.11	1.98
All cars on line	1.88	1.90	1.39	1.73	1.69	1.78	4.72	1.85	2.01	3.26	2.02	1.88

REVENUES AND EXPENSES OF RAILWAYS.

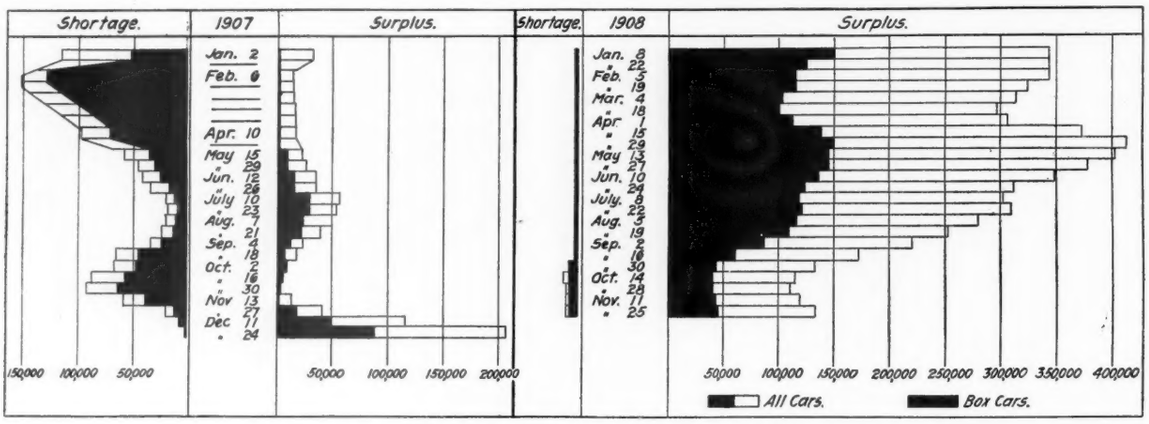
MONTH OF OCTOBER, 1908.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atchison, Topeka & Santa Fe	7,459	$4,503,912	$1,505,897	$6,510,778	$890,025	$1,136,719	$128,327	$1,825,357	$142,446	$4,122,874	$2,387,904	.....	$265,113	$2,122,791	$89,234
Atlantic Coast Line	4,407	1,622,050	439,331	2,222,772	304,152	313,194	34,009	704,166	55,082	1,410,603	812,169	.....	90,000	722,169	48,506
Baltimore & Ohio	3,992	5,090,102	1,147,484	6,594,988	752,029	920,007	130,113	2,152,522	123,678	4,078,349	2,516,639	$55,770*	174,835	2,286,034	‡10,429
Boston & Maine	2,242	2,167,258	1,174,163	3,602,370	436,310	375,047	39,988	1,432,057	66,702	2,350,104	1,252,266	9,664	138,918	1,123,012	88,327
Chesapeake & Ohio	1,896	1,846,527	396,545	2,332,158	256,476	443,603	35,340	602,917	41,859	1,380,195	951,963	2,218*	67,100	882,645	‡56,339
Chicago & Alton	998	757,606	358,837	1,204,466	116,445	130,908	34,721	363,425	27,221	672,720	531,746	2,657*	30,000	499,089	33,360
Chicago & Northwestern	7,635	4,621,662	1,837,085	6,920,251	788,958	688,747	96,919	2,320,969	96,183	3,991,776	2,928,475	1,304	230,000	2,699,779	405,674
Chicago, Burlington & Quincy	9,023	5,268,866	1,817,531	7,688,451	1,164,184	1,145,697	130,800	2,258,398	164,983	4,864,063	2,824,388	4,904*	212,600	2,606,884	‡126,733
Chicago, Milwaukee & St. Paul	7,516	4,680,919	1,266,376	6,346,803	904,400	683,828	114,566	1,933,612	97,197	3,733,603	2,613,200	34,453	199,848	2,447,805	156,831
Chicago, Rock Island & Pacific	7,423	3,509,089	1,497,854	5,324,140	795,354	685,580	110,947	1,867,928	126,065	3,585,874	1,738,266	12,480*	188,909	1,536,876	‡154,829
Chicago, St. Paul, Minn. & Omaha	1,730	927,196	391,786	1,403,449	183,323	113,746	18,396	446,044	24,643	786,152	617,297	7	52,969	564,335	160,786
Denver & Rio Grande	2,552	1,434,344	459,663	1,977,560	231,270	316,678	43,228	662,542	65,555	1,319,273	658,287	5,615	67,750	596,152	‡74,233
Erie	1,902	3,283,259	664,529	4,196,033	420,209	844,945	80,799	1,301,661	76,371	2,723,985	1,472,048	72,009	105,994	1,438,063	748,204
Great Northern	6,728	4,959,110	986,396	6,223,607	755,272	564,699	72,018	1,436,715	84,949	2,913,653	3,309,954	21,387	253,142	3,078,199	376,678
Gulf, Colorado & Santa Fe	1,518	998,732	278,970	1,330,877	181,933	212,765	24,663	414,480	33,357	867,198	463,679	.....	32,429	431,249	248,967
Illinois Central	4,509	3,412,743	935,252	4,939,170	569,282	1,172,725	92,679	1,591,256	90,361	3,516,303	1,422,867	7,962*	191,867	1,223,038	104,684
Lehigh Valley	1,446	2,827,088	303,657	3,227,458	320,722	515,774	60,649	891,312	48,382	1,836,839	1,390,619	25,668	85,600	1,330,687	24,226
Louisville & Nashville	4,365	3,199,399	851,212	4,323,488	462,995	739,328	81,061	1,293,417	73,375	2,650,176	1,673,312	15,722*	112,337	1,545,253	312,669
Missouri, Kansas & Texas	3,072	2,039,866	676,877	2,824,648	324,162	350,346	54,242	840,374	69,348	1,638,472	1,186,176	4,840*	123,896	1,057,439	104,039
Nashville, Chattanooga & St. Louis	1,230	730,576	220,527	1,014,390	140,328	209,825	30,644	349,291	21,077	751,165	263,225	1,379*	20,000	241,846	‡9,815
New York, New Haven & Hartford	2,004	2,476,548	2,035,674	4,935,337	617,743	598,615	25,286	1,938,240	105,426	3,285,310	1,650,027	119,169	292,111	1,477,085	431,265
Norfolk & Western	1,921	2,145,604	302,602	2,529,666	250,537	426,483	38,911	716,808	52,680	1,485,419	1,044,247	903	87,600	957,550	44,197
Northern Pacific	5,649	5,329,510	1,601,703	7,269,067	779,716	729,476	69,862	1,869,775	91,623	3,540,452	3,728,615	45,064	327,108	3,446,570	402,275
Pennsylvania Co.	1,414	3,083,756	589,038	3,971,243	329,985	568,319	64,086	1,217,389	69,445	2,249,224	1,722,019	2,050*	136,720	1,583,249	‡88,889
Pennsylvania R. R.	4,163	9,208,732	2,484,551	12,465,298	1,122,092	2,600,871	189,669	4,190,372	278,532	8,381,537	4,083,762	23,387*	174,339	3,886,036	‡323,018
Pere Marquette	2,354	1,009,690	279,485	1,381,244	177,656	187,917	22,765	468,464	28,134	884,936	496,308	2,618	52,288	446,638	71,325
Philadelphia & Reading	1,007	2,920,893	562,829	3,629,580	260,239	628,321	37,380	1,045,465	55,936	2,027,341	1,602,239	46,196	60,780	1,587,655	‡104,035
Pitts., Cincinnati, Chicago & St. L.	1,471	2,068,236	589,078	2,971,385	348,347	479,264	65,488	989,390	53,480	1,935,969	1,035,416	303*	118,790	916,324	‡111,510
St. Louis & San Francisco	4,727	2,267,996	796,418	3,300,696	558,826	469,482	67,407	1,091,624	97,551	2,284,890	1,015,806	.....	148,427	867,379	‡111,125
San Pedro, Los Angeles & Salt Lake	1,099	392,928	219,815	649,717	112,000	85,822	21,992	199,981	19,791	439,586	210,131	3,740*	26,062	180,329	‡10,320
Seaboard Air Line	2,611	1,038,332	273,660	1,437,952	227,371	203,025	47,951	485,564	54,470	1,018,381	419,571	970*	50,500	368,101	‡19,817
Southern Railway	7,294	3,409,315	1,172,938	4,973,993	558,240	755,150	94,971	1,605,226	145,054	3,158,641	1,815,352	17,317	152,845	1,679,824	103,608
Texas & Pacific	1,885	1,101,964	358,330	1,535,091	134,136	214,494	15,246	532,634	33,191	929,701	605,390	1,491*	80,000	523,899	129,901
Union Pacific	3,301	3,375,038	884,326	4,641,936	387,017	424,008	80,773	1,044,598	91,584	2,027,980	2,613,956	727*	107,662	2,505,567	766,302
Wisconsin Central	1,023	530,083	129,507	696,729	80,806	74,718	23,745	243,191	23,201	445,661	251,068	373	29,638	221,803	‡18,028
Yazoo & Mississippi Valley	1,371	763,631	175,266	999,937	167,468	224,888	15,467	337,923	23,425	769,171	230,766	4,357	34,590	200,533	33,331
FOUR MONTHS OF FISCAL YEAR.															
Atchison, Topeka & Santa Fe	7,459	16,674,041	6,159,355	24,737,968	3,207,503	4,408,813	482,832	6,539,319	513,780	15,152,247	9,585,721	.....	1,062,410	8,523,311	201,950
Atlantic Coast Line	4,407	5,182,312	1,715,329	7,443,285	1,161,575	1,189,177	129,815	2,628,657	227,946	5,337,170	2,106,115	.....	360,000	1,746,115	196,057
Baltimore & Ohio	3,992	18,799,697	4,882,314	25,004,554	3,048,908	3,447,412	534,202	8,909,693	477,458	15,598,673	9,405,881	168,241*	671,459	8,566,181	‡546,151
Boston & Maine	2,242	7,542,806	5,478,493	14,045,074	1,866,002	1,419,947	168,830	5,819,332	285,087	9,559,198	4,485,876	46,423	552,107	3,980,192	‡319,506
Chesapeake & Ohio	1,896	6,977,372	1,691,355	9,029,194	1,096,438	1,648,885	145,305	2,310,991	163,893	5,365,512	3,663,682	9,447*	264,800	3,389,435	‡223,633
Chicago & Alton	998	2,758,368	1,471,999	4,583,959	411,713	463,242	143,219	1,298,485	111,020	2,427,679	2,156,280	7,543*	120,000	2,028,737	490,574
Chicago & Northwestern	7,635	15,922,316	6,725,110	24,443,907	3,171,537	2,549,131	382,137	8,192,783	370,371	14,665,959	9,777,948	26,218	920,000	8,884,166	592,261
Chicago, Burlington & Quincy	9,023	18,313,857	7,658,147	28,227,597	4,395,512	4,325,464	533,875	8,142,648	659,532	18,057,031	10,170,566	7,792*	850,400	9,312,374	‡1,103,931
Chicago, Milwaukee & St. Paul	7,516	15,591,542	5,235,942	22,444,546	3,063,112	2,430,216	421,822	7,266,392	344,905	13,526,447	8,918,099	146,648	792,477	8,272,270	22,436
Chicago, Rock Island & Pacific	7,423	12,558,223	6,452,529	20,208,879	3,134,203	2,551,708	436,829	7,002,289	493,095	13,618,124	6,590,755	35,110*	711,292	5,844,352	44,208
Chicago, St. Paul, Minn. & Omaha	1,730	2,967,797	1,509,262	4,784,419	726,691	472,970	82,966	1,609,687	101,913	2,994,227	1,790,192	6,047	211,878	1,584,361	188,741
Denver & Rio Grande	2,552	5,026,855	2,037,082	7,404,077	917,488	1,029,208	164,572	2,316,245	206,734	4,634,247	2,769,830	38,524	259,750	2,548,604	‡320,079
Erie	1,902	11,066,340	3,145,705	15,203,572	1,732,858	3,059,331	302,091	4,824,095	301,426	10,219,711	4,983,861	201,243	376,622	4,808,482	375,945
Great Northern	6,728	15,700,627	4,223,519	20,996,349	4,208,367	2,230,320	238,205	5,088,876	335,480	12,101,248	8,895,101	127,440	812,772	8,209,769	‡940,065
Gulf, Colorado & Santa Fe	1,518	3,185,711	1,010,958	4,413,450	681,825	733,526	77,972	1,465,351	134,481	3,093,155	1,320,295	.....	129,717	1,190,578	594,893
Illinois Central	4,509	11,805,603	3,938,113	17,886,733	2,476,626	4,509,787	393,060	6,059,051	363,886	13,802,410	4,084,323	7,383*	753,358	3,323,582	‡666,015
Lehigh Valley	1,446	9,568,397	1,588,776	11,514,663	1,185,959	2,127,040	254,377	3,296,706	209,616	7,073,698	4,440,965	282*	342,400	4,098,283	‡1,033,647
Louisville & Nashville	4,365	11,083,578	3,611,652	15,608,235	1,788,543	2,628,261	325,112	4,878,556	312,146	9,932,618	5,675,617	34,670*	449,350	5,191,597	724,234
Missouri, Kansas & Texas	3,072	6,317,816	2,484,346	9,265,431	1,170,667	1,428,697	187,653	3,061,223	256,053	6,104,293	3,161,138	4,432*	417,949	2,738,757	‡744,808
Nashville, Chattanooga & St. Louis	1,230	2,526,438	931,798	3,703,519	491,133	716,003	133,765	1,321,435	92,026	2,754,362	949,157	2,960*	80,000	866,197	‡129,834
New York, New Haven & Hartford	2,004	8,779,063	8,337,588	18,684,525	2,370,405	2,098,051	96,120	7,394,671	364,834	12,324,081	6,360,444	450,623	1,132,546	5,678,521	‡234,435
Norfolk & Western	1,921	8,294,519	1,293,243	9,912,389	1,089,689	1,651,019	150,843	2,774,268	206,371	5,872,189	4,040,200	617*	350,400	3,689,182	‡289,824
Northern Pacific	5,649	17,456,020	6,758,440	25,586,222	3,093,673	2,753,820	293,111	6,666,672	339,015	13,146,291	12,439,930	196,576	1,059,794	11,576,712	106,072
Pennsylvania Co.	1,414	11,350,992	2,505,819	15,033,293	1,224,320	2,222,954	243,534	4,599,910	282,975	8,573,693	6,459,600	3,408*	520,330	5,935,862	‡568,858
Pennsylvania R. R.	4,163	33,034,024	10,433,142	46,410,279	5,023,157	8,325,318	641,386	16,196,800	1,124,742	31,311,403	15,098,876	317,496	697,357	14,719,015	‡2,763,630
Pere Marquette	2,354	3,158,131	1,386,913	4,908,494	617,741	717,132	107,159	1,794,759	113,177	3,349,968	1,558,526	13,465	209,311	1,362,680	88,984
Philadelphia & Reading	1,007	9,999,501	2,180,944	12,734,289	1,098,526	2,390,320	155,659	3,814,883	214,772	7,674,160	5,060,129	86,273	243,740	4,902,662	‡1,373,639
Pitts., Cincinnati, Chicago & St. L.	1,471	7,405,458	2,552,413	11,166,342	1,161,870	1,880,846	242,405	3,698,206	230,015	7,213,342	3,953,000	1,788*	439,415	3,511,797	‡250,265
St. Louis & San Francisco	4,727	7,958,763	3,250,057	12,125,679	1,962,672	1,655,008	247,255	4,104,779	370,702	8,340,416	3,785,263	.....	479,950	3,305,313	‡347,002
San Pedro, Los Angeles & Salt Lake	1,099	1,332,203	833,107	2,304,577	406,573	295,162	91,889	750,523	67,241	1,611,388	693,189	7,764*	92,795	592,630	103,291
Seaboard Air Line	2,611	3,393,693	1,074,858	4,941,781	768,775	763,060	176,612	1,759,710	189,944	3,658,101	1,283,680	4,095*	202,000	1,077,585	‡32,835
Southern Railway	7,294	11,314,021	4,958,576	17,694,970	1,123,904	2,573,901	387,520	6,021,467	553,499	11,660,291	6,034,679	43,975	637,578	5,441,077	1,005,301
Texas & Pacific	1,885	3,199,655	1,298,458	4,765,907	555,175	727,314	58,786	1,826,007	131,089	3,298,371	1,467,536	6,259*	322,016	1,139,261	‡125,200
Union Pacific	3,301	12,274,540	3,700,493	17,268,703	1,871,455	1,567,002	319,021	3,644,523	348,837	7,750,838	9,517,865	4,758	430,650	9,091,973	2,672,566
Wisconsin Central	1,023	1,935,449	631,591	2,718,357	318,694	292,175	96,231	876,624	81,645	1,665,369	1,052,988	3,514	116,904	939,598	‡46,437
Yazoo & Mississippi Valley	1,371	2,014,907	683,598	2,884,204	774,759	643,954	65,513	1,234,020	91,320	2,809,566	74,638	13,970	138,360	49,751†	‡283,025

*Deficit. †Loss. ‡Decrease.

Car Surpluses and Shortages.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting bulletin No. 35-A, giving a summary of surpluses and shortages by groups from November 27, 1907, to November 25, 1908, says: "The surplus shows an increase of 11,655 cars, making a total of 132,829 idle available cars. Taken in connection with the shop reports, which show a decrease of 10,119 in the number of bad order cars, this report would seem to indicate but little change in the situation since our last report. It will be noted that there are still some shortages reported, but with the exception of the Canadian lines, these shortages are slight, and are generally filled from surplus stocks on the roads reporting them. The large shortage reported in Group 11 (Canadian) is in the extreme western portion of the Dominion, and is less an actual shortage than a temporary delay in providing equipment from districts where empties are more plentiful, the distance from the base of supply being an important factor in the situation."



Car Surpluses and Shortages in 1907 and 1908.

Car Surpluses and Shortages, from November 27, 1907, to November 25, 1908, inclusive.

	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
November 11, 1908	160	43,274	10,516	39,848	27,536	121,174	9,291	295	1,287	786	11,659
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249
January 22, 1908	161	124,622	27,328	142,388	48,292	342,580	392	132	79	135	738
December 24, 1907	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265	724
November 27, 1907	160	16,246	3,645	10,028	10,429	40,348	11,908	868	2,964	2,224	17,964

Reduction of Express Rates in Massachusetts.

After much popular protest in Massachusetts, especially in Boston, against the revised express charges of the American and National express companies, and after prolonged public hearings, at which the Boston merchants were strongly represented by counsel, the railway commissioners decided that the rates were "excessive and unreasonable." The commission does not have power to make rates, but only to recommend. Under date of Nov. 14 the American Express Company, by C. W. Robie, General Manager, sent a reply, in which he said: "While we regret exceedingly that in the opinion of your honorable board the evidence submitted by the American Express Company, in the hearings which resulted from the above complaint, was not sufficient to justify the rates assessed by the company since February 10, 1908, and that you, therefore, felt obliged to say in your ruling of October 2 that the rates were 'excessive and unreasonable,' the company has decided to reduce the rates between Boston and offices in the 50-mile zone from 50 cents to 40 cents per 100 lbs., which also means a reduction of from 5 cents to 15 cents on shipments weighing over 5 lbs. and under 100 lbs., as shown by the 'graduate' table—one under 40 cents per 100 lbs., and one under 50 cents per 100 lbs. enclosed herewith. I also enclose a copy of the 40-cent 'graduate,' which was applied on business in this territory previous to February 10, 1908, from which you will see that the rates per 100 lbs. 'graduate' put in operation as a result of decision rendered by your honorable board, shows an increase of over 12 per cent. over the old rates. The rate per 100 lbs. 'graduate' complained of and now abolished was an increase of 41 per cent. over the old rates. The reduction means, so far as the American Express Company is concerned, that they will continue to handle business without profit."

Boston merchants are much dissatisfied with the new rates and do not regard the express companies as at all complying with the spirit of the decision of the railway commissioners. The new Merchants' Association met on the evening of November 19 and the report of the committee on express companies emphasized the dissatisfaction with the course of the American and National companies and looked strongly toward a reopening of the case before the railway commission, or taking the matter to a higher tribunal.

Texas Commission Permanently Enjoined from Discriminating.

The Texas Supreme Court on December 2 refused the application of counsel for the Railroad Commission of Texas for a writ of error in the case of the Galveston Chamber of Commerce v. the Railroad Commission of Texas. The effect of the action of the Supreme Court is perpetually to enjoin the Commission from enforcing its order fixing a differential against Galveston in favor of Houston, in rates from points on the St. Louis, Brownsville & Mexico. For many years railway freight rates to Galveston from various points in Texas were made by adding the water rate between Houston and Galveston to the railway mileage rate to Houston. The completion of the St. Louis, Brownsville & Mexico to its con-

nection with the Gulf, Colorado & Santa Fe at Algoa, made the rail distance from Galveston to points on that line about the same as from Houston. The Galveston Chamber of Commerce then objected to the enforcement of the differential rates as being, on the mileage basis, a discrimination against Galveston. One of the district courts of Travis county, the Court of Civil Appeals and finally the Supreme Court, upheld the contention of Galveston.

Gross Earnings Defined in Minnesota.

In a decision in the suit brought by Minnesota against the Minnesota & Internal, to get an adequate definition of the term gross earnings, the state supreme court said, Nov. 27:

"The gross earnings which form the basis of the 3 per centum under the provision of the special laws of 1873 is not limited to earnings derived from the operation of trains, but includes all earnings received by such railway companies while performing work incidental to or connected with the business of transportation, and which may reasonably be considered within the scope of their corporate powers.

"The following items constitute gross earnings:

"The amount received from lumber companies and other parties in moving, transferring and switching cars at loading works.

"The amount received for the use of railway companies' equipment, such as steam shovels, hoisting machinery, work trains, cars and engines, including crews.

"Money received from other railway companies for the use of work trains employed in the service of construction work.

"The amount received by the company for its cars employed in transportation in excess of amount paid out by it for the use of cars of other companies."

Wells Fargo Coast Rates.

The facts with regard to the alleged increase in Wells Fargo rates to the Pacific coast are as follows:

About two years ago the company voluntarily put into effect to Pacific coast terminal points, reached exclusively by Wells Fargo & Co., rates on quantity shipments as follows:

500 lbs.,	and	less	than	1,000	lbs.	$12.00	per	cwt.
1,000 "	"	"	"	2,000	"	11.00	"	
2,000 "	"	"	"	5,000	"	10.00	"	
5,000 "	"	"	"	10,000	"	9.00	"	
10,000 "	"	"	"	20,000	"	8.00	"	
20,000 "	and over					7,00	"	

The main reason for this at the time was to assist the San Francisco merchants because of the disaster which had befallen them during the earthquake and fire of April, 1906. These rates have been continued to the present time, but some months ago a number of merchants in San Francisco formed what they termed The California Commercial Association, which in fact was merely a forwarding agency, and shipments from New York city to its members were gathered together and bulked at eastern shipping points and forwarded to one consignee in an endeavor to secure the benefit of the quantity rates heretofore mentioned.

It has been a rule of all express companies at all times to refuse what are termed "bulked" or "aggregated" shipments when the same contain packages from various shippers to various consignees. As the Wells Fargo Company refused to give such shipments the benefit of its quantity rates, the matter was brought before the Interstate Commerce Commission by the California Commercial Association, in the form of a complaint, and recently the Commission handed down an order holding that the quantity rates should apply to such bulked shipments. The Wells Fargo Company was about to apply for an injunction against the enforcement of such order, when the Commission withdrew it, and called for a rehearing.

As the quantity rates had brought about the trouble, the easiest solution seemed to be to cancel the quantity rates, since they were being taken advantage of in a manner not contemplated when the rates were put in effect. A similar question as to bulking shipments came up in the case of the Delaware, Lackawanna & Western, *et al.*, *vs.* Interstate Commerce Commission *et al.*, because of the order of the Commission in the Export Shipping case. Here, the Circuit Court of the United States issued an injunction restraining the Interstate Commerce Commission from putting in effect its order.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

R. L. Roe has been appointed Auditor of the Marcellus & Otisco Lake, with office at Marcellus, N. Y.

John Leslie has been appointed Assistant Comptroller of the Canadian Pacific, with office at Montreal, Que.

John G. McKay has been appointed Assistant Claim Agent of the Gulf, Colorado & Santa Fe, with office at Temple, Tex.

Phillip Jay has been appointed Assistant Claim Agent of the St. Louis, Iron Mountain & Southern at Little Rock, Ark., succeeding A. T. Norton, resigned.

W. B. Smith has been appointed General Attorney for Arkansas of the Missouri & North Arkansas, with office at Little Rock, Ark. He will have full authority over all legal matters in that state.

H. M. Moors has been appointed Freight Claim Agent of the Louisiana Western and Morgan's Louisiana & Texas, with office at New Orleans, La., succeeding F. W. Pope, resigned on account of ill health.

Operating Officers.

A. Southern has been appointed Car Accountant of the Inland Empire System, succeeding H. C. Lawton, resigned.

R. N. Elliott has been appointed Terminal Superintendent of the Mexican Central at Manzanillo and will have charge of all terminal service, including station, wharves, yards and custom house.

The line of the Mexican Central between Tuxpan and Manzanillo was turned over on December 1 to the operating department of the Mexican Central, and all employees on the Tuxpan-Manzanillo line report to the proper officers of the Mexican Central.

A. Galloway, Chief Inspector of Trains and Station Service of the Southern Pacific, has been appointed General Superintendent of the Ocean Shore Railway, with office at San Francisco, Cal. Mr. Galloway has been with the Southern Pacific for five years, and previous to that had been Superintendent of the Cincinnati, Hamilton & Dayton for 11 years.

C. B. Wilburn, General Superintendent of the Atlanta, Birmingham & Atlantic, with office at Brunswick, Ga., has been appointed Superintendent of the Birmingham division, with office at Talladega, Ala., succeeding C. L. Bruner, and his former office has been abolished. Mr. Bruner has been appointed Terminal Trainmaster at Brunswick, Ga., a new office.

Traffic Officers.

June Stone has been appointed Traveling Passenger Agent of the Louisville & Nashville, with office at Evansville, Ind.

E. S. Center has been appointed Contracting Freight Agent of the Atlanta & West Point and the Western of Alabama at East Point, Ga.

F. G. Abbey has been appointed Traveling Freight Agent of the Missouri, Kansas & Texas at Houston, Tex., succeeding J. L. Shockley, resigned.

R. J. McCarty, Jr., has been appointed Local Freight Agent of the Kansas City Southern, at Kansas City, Mo., succeeding S. W. Storey, resigned.

W. E. England has been appointed Traveling Freight Agent of the Missouri Pacific-Iron Mountain Lines, at Memphis, Tenn., succeeding H. C. Oglivie, promoted.

Allan Cameron, General Traffic Agent for Europe of the Canadian Pacific, has been appointed Assistant Traffic Manager, with office at New York, succeeding E. V. Skinner, deceased.

G. D. Williams has been appointed Soliciting Freight Agent of the Nashville, Chattanooga & St. Louis, with office at Chicago, succeeding C. A. Turnell, resigned to engage in other business.

J. H. Andrews, Traveling Freight Agent of the Southern Railway at Greensboro, N. C., has been appointed Traveling Freight Agent at Raleigh, N. C. F. L. Word succeeds Mr. Andrews.

W. E. Zirckel, Traveling Freight Agent of the Chicago & Alton at Pittsburgh, Pa., has been appointed Traveling Freight Agent of the Denver & Rio Grande at Pittsburgh. This is a new office.

F. M. Jenifer, General Agent of the Tonopah & Tidewater at Goldfield, Nev., has been appointed Assistant to the Traffic Manager, with office at Los Angeles, Cal. W. W. Keith succeeds Mr. Jenifer.

H. H. Brown has been appointed Assistant General Freight Agent of the Great Northern, at St. Paul, Minn., succeeding G. I. Sweney, resigned to become President and Treasurer of the Bartles-Sweney Co., Waterloo, Iowa.

B. J. Christman has been appointed General Southeastern Agent of the Armour Freight Lines, with office at Atlanta, Ga., succeeding J. M. Fleming, resigned to become Manager and Secretary of the Georgia Fruit Exchange.

John A. Hulen has been appointed Commercial Agent for the Chicago, Rock Island & Pacific and the St. Louis & San Francisco at Houston, Tex., succeeding Charles D. Golding, whose resignation was announced in our issue of November 20.

T. C. Cross has been appointed Commercial Agent of the Clyde Freight Line, with territory in middle Alabama and Mississippi, with office in Birmingham, Ala. E. B. Evans remains in charge of northern Alabama, including Birmingham.

C. P. Daither, Commercial Agent of the Atlanta, Birmingham & Atlantic at Philadelphia, Pa., has been appointed General Freight Agent of the Brunswick Steamship Co. George W. Diehl, Traveling Freight Agent of the Atlanta, Birmingham & Atlantic, succeeds Mr. Daither, and S. B. Smith succeeds Mr. Diehl.

The International & Great Northern has opened new offices in the Third National Bank building, St. Louis, Mo., in charge of Joseph H. Houston as General Freight Agent. Mr. Houston was formerly Commercial Agent of the St. Louis Southwestern, at St. Louis. W. S. Cornell, chief rate clerk of the St. Louis Southwestern, at St. Louis, has been appointed Chief Clerk. J. J. McCarthy, Soliciting Freight Agent of the Missouri Pacific, has been appointed Commercial Agent, and T. B. Moss, Soliciting Freight Agent of the St. Louis Southwestern, has been appointed Traveling Freight Agent.

Engineering and Rolling Stock Officers.

Lincoln Bush, Chief Engineer of the Delaware, Lackawanna & Western, has resigned.

J. H. Connelly has been appointed Assistant Roadmaster of the Inland Empire System, with office at Spokane, Wash.

W. A. George has been appointed Superintendent of Shops of the Atchison, Topeka & Santa Fe, with office at Albuquerque, N. Mex.

Joseph Shea has been appointed Superintendent of Water Service of the St. Louis & San Francisco, with office at St. Louis, Mo.

Edward C. Cole has been appointed Traveling Engineer of the Iowa Central, with office at Des Moines, Iowa, succeeding W. B. Ferris.

B. H. Lent has been reappointed Road Foreman of Engines of the Arizona division of the Atchison, Topeka & Santa Fe, with office at Needles, Cal.

H. K. Lowry has been appointed Assistant Signal Engineer of the Chicago, Milwaukee & St. Paul, with office at Milwaukee, succeeding C. O. Harrington.

George K. Anderson has been appointed Road Foreman of Engines of the Albuquerque division of the Atchison, Topeka & Santa Fe, with office at Winslow, N. Mex.

T. N. Ely, Chief of Motive Power of the Pennsylvania, has been granted a protracted leave of absence to visit Italy, France and Egypt. He sails on December 12.

The offices of M. S. Monroe, Master Mechanic, and J. P. Callahan, Master Car Builder, of the Chicago, Lake Shore & Eastern, have been moved from South Chicago, Ill., to Gary, Ind.

E. L. McDill has been appointed Acting General Foreman of Bridges and Buildings of the Middle division of the Missouri, Kansas & Texas, with office at Denison, Tex., succeeding J. G. Gossett, resigned.

H. F. Staley, General Foreman of the Norfolk & Western at Bluefield, W. Va., has been appointed Master Mechanic of the Carolina, Clinchfield & Ohio, with office at Johnson City, Tenn., succeeding H. L. Hobbs, transferred.

Capt. Azel Ames, Signal Engineer Electric Zone, New York Central & Hudson River, has resigned to take charge of the railway department of the Kerite Insulated Wire & Cable Co., New York, with office at 30 Church street, New York City.

C. R. McMillan, Supervisor of the Pennsylvania at Tyrone, Pa., has been appointed Supervisor in the office of the Principal Assistant Engineer at Altoona, Pa.; H. L. Thomas, Supervisor at Paoli, has been appointed Supervisor of division No. 5 of the Philadelphia division; C. R. Sinnickson, Supervisor at Haddonfield, N. J., has been appointed Supervisor of division No. 2 of the Philadelphia division; Elmer Irving, Supervisor at Osceola Mills, Pa., has been appointed Supervisor of division No. 32 of the Philadelphia division; J. B. Hutchinson, Jr., Supervisor at Newport, Pa., has been appointed Supervisor of division No. 9 of the Middle division; D. T. Easby, Supervisor at South Fork, Pa., has been appointed Supervisor of division No. 5½ of the Middle division; M. I. Ward, Supervisor at Harrisburg, Pa., has been appointed Supervisor of division No. 7 of the Middle division; F. W. L. Schneider, Supervisor at West Brownsville, Pa., has been appointed Supervisor of division No. 8 of the Middle division; T. E. Lightfoot has been appointed Supervisor of division No. 23 of the Tyrone division, and M. Lipman has been appointed Supervisor of division No. 22 of the Tyrone division.

OBITUARY.

George W. Butcher, who just recently retired as Superintendent of Motive Power and Machinery of the San Antonio & Aransas Pass, died at San Antonio, Tex., on December 4.

D. Burkhalter, Superintendent of the Sacramento division of the Southern Pacific, died at Sacramento on December 2. He was born in 1840, and previous to 1888 was Trainmaster of the Southern Pacific at Truckee, Cal. In March, 1888, he was appointed Assistant Superintendent of the Sacramento & Oregon division, and in 1891 was transferred as Superintendent to Bakersfield, Cal., and about a year ago was transferred to the Sacramento division.

F. W. Baldwin, General Superintendent of the National Railroad of Mexico and of the Interoceanic of Mexico, died on December 5 at Mexico City. He was born in 1854 at Weedsport, N. Y., and began railway work in 1869 as station agent's clerk and operator on the Central Vermont. In 1871 he was transferred to the auditing department as clerk, and two years later became station agent and operator. In 1877 he was put in charge of freight trainmen and the distribution of cars, and in 1881 was made clerk to the Superintendent of the Texas Mexican. By 1882 he had become Trainmaster, and the next year was appointed Trainmaster of the Mexican National, now the National Railroad of Mexico. In 1884 he was appointed Assistant General Superintendent, and two years later returned to the Central Vermont as Superintendent of the Ogdensburg & Lake Champlain division. In 1891 he was promoted to Assistant General Superintendent, and the next year was made General Superintendent. In April, 1903, he became Trainmaster of the National Railroad of Mexico, and in June, of the same year, was appointed Superintendent of the Pacific division. In November, 1905, he was appointed Superintendent of Transportation of the Interoceanic. In June, 1907, he was appointed General Superintendent, with jurisdiction over both the Interoceanic of Mexico and the National Railroad of Mexico.

Railroad Construction.

New Incorporations, Surveys, Etc.

ADIRONDACK & ST. LAWRENCE.—An officer of this company, which is operating a line from DeKalb Junction, N. Y., to Herman, four miles, writes that the line is under survey from Herman to Clifton, 23 miles.

ALGOMA CENTRAL & HUDSON BAY.—An officer writes that surveys have been made for an extension from the present end of track at Mile, 69.35 miles, at the Chippewa river, Ont., north to Michipicoten, mile 103.65. No construction work under way at the present time. The extension has not yet been definitely decided upon. (July 24, p. 599.)

ARTESIAN BELT.—An officer writes that rails, ties and bridge timber are on the ground and that track laying has been started on the first section of this line. The company's plans call for a line from Macdona, Tex., south via Kirk, Fruitland, Poteet, Brooklyn, New Pleasanton and New Artesia to Simmons City. Contract has been given to J. F. Burns, of Divine, for the grading and track laying on the first 40 miles. The line is to be laid with 60-lb. rail. Dr. C. F. Simmons, President, Excelsior Springs, Mo., and Wm. Bradburn, Chief Engineer, 215 Alamo Plaza, San Antonio, Tex. (November 13, p. 1373.)

BALTIMORE & OHIO.—On the Connellsville division a new branch has been opened for business from Niver Junction, Pa., to Macdonaldton, three miles; and on the same division the Jenner branch has been extended from Jenner, Pa., to Acosta, three miles.

BAY POINT & CLAYTON.—An officer of this company, which operates a line from Bay Point, Cal., to Cowell, 10 miles, writes that surveys have been completed from Cowell to Clayton, three miles, and from Bay Point station to Bay Point landing, 1½ miles.

BILLINGS & NORTHERN.—See Great Northern.

BURR'S FERRY, BROWNDEL & CHESTER.—An officer writes that work is now under way on the extension from Turpentine, Tex., east to Browndel, 18 miles. (Aug. 28, p. 838.)

CALIFORNIA, NEVADA, IDAHO & NORTHERN.—An officer writes that work is now under way by the Canyon Construction Co., of Caldwell, Idaho, building a line from Caldwell west to Homedale, 17 miles. Surveys made beyond Homedale south to Jordan Valley, Ore., 60 miles. F. H. Richardson, Chief Engineer, Caldwell.

CANADIAN NORTHERN.—This company has opened a new branch called the Oakland branch from Portage la Prairie, Man., to Totogan, 28 miles.

CANADIAN PACIFIC.—An officer of the Esquimalt & Nanaimo writes that work is now under way by John Bright, of Vancouver, and Dixon & Moore, of Parkesville, B. C., on an extension from Wellington, B. C., to French Creek, 23 miles. Surveys have been made for a further extension of 35 miles from French Creek to Aberni, at the east end of the Alberni canal, Vancouver island. (Oct. 9, p. 1120.)

The Outlook section of the Western division has been extended from Tugaski, Sask., north to Conan, 38.2 miles. On the central division the Sheho section has been extended from Sheho, Sask., westward to Leslie, 24 miles. The Teulon branch has been extended from Teulon, Man., northward to Komarno, eight miles, and the Reston branch has been extended from Baring, Sask., to Wolseley, 17 miles.

CENTRAL RAILROAD OF LOUISIANA.—An officer writes that this company has work under way on a line from Leesville, La., which is projected to New Orleans, 242 miles. C. L. Provost, New Iberia, may be addressed.

CHESTNUT RIDGE.—An officer writes that this company, operating 11 miles of railroad from Chestnut Ridge (Kunkletown), Pa., southwest to Lehigh Gap, has work under way on an extension from Millport, Pa., south to Palmerton, two miles, and that an extension is projected from Kunkletown north to Saylorsburg, eight miles.

CHICAGO, MILWAUKEE & ST. PAUL.—The town site of South Cle Elum, Wash., just across the Yakima river from Cle Elum and about 24 miles west of Ellensburg, containing about 15,000 acres of land, has just been opened to the public by this company. Cle Elum will be the last division point for the line before reaching the coast. Construction trains are running through Cle Elum and regular service will be established at an early date. (See Oregon & Washington and also Tacoma, Wash., under Railroad Structures.)

CLEVELAND SHORT LINE.—An officer of this company, which is operating the Belt Line around Cleveland, writes that the line is under construction from West Park, Ohio, to Mill Creek Junction, 10 miles.

COLORADO & NORTHERN.—An officer of this company writes that the line is projected from Hayden, Colo., to Cottonwood, 15 miles.

COLORADO & WYOMING.—An officer writes that surveys have been made for a six-mile extension from Tercio, Colo., northwest to Stonewall. Grading has been finished from Tercio to Cornell, three miles, but no track has yet been laid. J. Coan, Tercio, is the contractor. R. M. Hosea, Chief Engineer, Pueblo.

COLORADO, COLUMBUS & MEXICO.—An officer writes that surveys are now under way by this company for a line to be built from Columbus, N. Mex., north to Gallup, 300 miles. A. O. Bailey, Columbus, may be addressed.

DENVER, LARAMIE & NORTHWESTERN.—See this company under Railroad Financial News.

DULUTH & IRON RANGE.—This company has work under way at Two Harbors, Minn., on a new yard. There will be 6.2 miles of track laid in the yard. Jones Bros., Cincinnati, Ohio, have a contract for the grading work.

DULUTH & NORTHERN MINNESOTA.—This road is now in operation from Knife River, Minn., northeast to Finland, 50 miles.

ELDORADO, MARION & SOUTHWESTERN.—An officer of this company, which operates a line from Marion, Ill., east to Pittsburgh, writes that the line is under construction from Pittsburgh to Allegheny, six miles, and under survey from Allegheny to Eldorado, 20 miles.

EL RENO & WESTERN.—See Fort Smith & Western.

ESQUIMALT & NANAIMO.—See Canadian Pacific.

EVANSVILLE, MT. CARMEL & OLNEY (ELECTRIC).—An officer writes that sufficient stock has been subscribed to cover the surveys, estimates, etc., on the line from Evansville, Ind., to Olney, Ill., and that a meeting of the directors will be held at an early date in Vincennes, Ind., to close contracts with the engineers. (Nov. 20, p. 1418.)

FORT SMITH & WESTERN.—This company and the El Reno & Western have been furnished, by jobbers and shippers at Oklahoma City, Okla., with statements of the approximate amount of traffic which the roads can receive if they extend their lines to that city. It is also said that officers of the lines have promised that the extensions will be made if the traffic probably available will justify.

GRAND TRUNK PACIFIC.—M. P. & J. T. Davis, railway contractors, Quebec, Que., have been awarded contracts for construction work in the following sections: Districts D and E.—From the western end of Fauquier Bros. Abitibi contract, westerly for 104 miles. District E.—From a point about 60 miles west of the easterly boundary of this district in an easterly direction to the west of Fauquier Bros.' contract, north to Lake Nepigon, about 100 miles. This work is to be completed by December 31, 1910.

Press reports say that the Canadian Railway Commission has authorized the Grand Trunk Pacific to operate its Lake Superior branch from Ft. William, Ont., northwest to the main line at a point about 244 miles east of Winnipeg. (Dec. 4, p. 1500.)

GREAT NORTHERN.—The Billings & Northern, formerly running from Great Falls, Mont., southeast to Judith Gap, 120 miles, on the Butte division, has been extended from Judith Gap, eastward to Billings, 118 miles. (Sept. 11, p. 933.)

HELENA, PARKIN & NORTHERN.—Incorporated in Arkansas, with a capital stock of $360,000, to build a line from Whitmore, Ark., in St. Frances county, north about 50 miles to Marked Tree, in Poinsett county. The incorporators include B. S. Watross, G. Casey, E. F. Cooley, all of Lansing, Mich., and T. E. Hare, of Vandale, Ark.

IDAHO & WASHINGTON NORTHERN.—An officer writes that work is under way by Grant, Smith & Co., of Spokane, Wash., on an extension from Newport, in the state of Washington, north to Cement, 52 miles. Surveys have been made for a further extension of three miles from Cement to Meta line. (Oct. 9, p. 1121.)

ILLINOIS TRACTION.—This system comprises various lines from Danville, Ill., southwest to St. Louis, Mo., with lines north to Peoria, having a total of about 530 miles. Work is now under way on an extension into St. Louis, Mo., which includes building a bridge over the Mississippi river from the foot of Salisbury street, St. Louis to Venice, Ill. The piers will be finished during 1908 and contracts for the superstructure are to be let in the near future. The company expects to be using its own bridge and terminals in St. Louis before the end of 1909; the improvements include a passenger station and freight house to cost, with the bridge, about $5,000,000. The company has plans for building an extension on the north, one of 47 miles and the other 30 miles, to complete a continuous interurban line from St. Louis northeast to Chicago. (R. R. G., March 13, 391.)

KENTUCKY MIDLAND.—An officer writes that this company is building an extension from Cypress Creek, Ky., to Madisonville, 16 miles. M. M. Wheeler, Chief Engineer, Central City, Ky. (R. R. G., March 13, p. 391.)

KEWEENAW CENTRAL.—An officer of this company, which operates a line from Painesdale, Mich., northeast to Mandan, writes that surveys are being made from Mandan to Fish Cove, 12 miles.

KOKOMO WESTERN TRANSPORTATION CO.—An officer writes that surveys have been made and this project partly financed. The company proposes to build a line, to be operated by gasolene motor cars, from Kokomo, Ind., west to Burlington, 16 miles. As soon as the company has finished its financial arrangements construction work is to be started. C. C. McFann, President and General Manager, Kokomo.

LAKE SHORE & MICHIGAN SOUTHERN.—An officer writes that it is expected to begin track laying soon on the extension of the Lake Erie & Pittsburgh from Mill Creek Junction, near Cleveland, Ohio, to Kent, 24 miles. The Carter Construction Co., Indianapolis, Ind., have contracts for grading and masonry work. (R. R. G., April 3, p. 493.)

LAKE ERIE & PITTSBURGH.—See Lake Shore & Michigan Southern.

LARAMIE, HAHNS PEAK & PACIFIC.—An officer writes that work is now under way on an extension from the present end of track at Albany, Wyo., south to Summit, 15 miles. Bradbury & Dittmer are the contractors. The extension is projected south from Summit to Coal Bank, Colo., an additional 55 miles, and about 110 miles from Laramie. (Sept. 4, p. 889.)

LIVE OAK, PERRY & GULF.—Work is now under way by H. E. Warwick, of Hampton Springs, Fla., building an extension of this road, now in operation from Live Oak, Fla., southwest to Hampton Springs, 49 miles; from Hampton Springs west to St. Marks, 30 miles.

LONG ISLAND.—An officer writes that this company is building with its own men the Glendale cut-off from Whitepot station, Long Island, to Glendale Junction. This is to be a double-track line, 2.03 miles. In addition, the Degnon Contracting Co., New York, is building a double-track cut-off 0.58 miles to the Montauk division at Long Island City, and second track work is under way by Andrews Bros., of Mineola, from Roslyn to Glen Cove, 5.08 miles. (July 3, p. 457.)

MARSHALL & EAST TEXAS.—Grading has been completed for some distance south of Marshall, Tex., and it is probable that about 20 miles of additional line will be built in a southerly direction from Marshall in the near future. Nothing has yet been determined regarding the time when contracts will be let. The maximum grade on the extension south will be about 1 per cent. and maximum curvature about 4 deg. (See Texas Roads, Nov. 13, p. 1375.)

MEXICAN CENTRAL.—The extension from Tuxpan, Jaslico, to Manzanillo, was turned over on December 1 to the operating department. (R. R. G., March 13, p. 396.)

MEXICAN SOUTHERN.—An officer writes that conversion of the Esperanza division to steam operation will be finished by the end of this year. The company has hitherto been operating the branch, which is 49.8 miles, with cars drawn by mules.

MEXICO, SANTA FE & PERRY TRACTION.—Right of way has, it is said, been secured by this company, and bids are asked for material, for building this proposed electric line from Mexico, Mo., northeast via Molino and Santa Fe to Perry, 25 miles. The line may eventually be extended on the south to Fulton and Columbia and on th orth to Hannibal. M. Crum, President, Mexico. C. O. Thon, Chief Engineer, Belleville, Ill. (R. R. G., Nov. 15, p. 665.)

MILWAUKEE & FOX RIVER VALLEY (ELECTRIC).—This company is making surveys along the east shore of Lake Winnebago, Wis. Application for a certificate of public convenience and necessity to build a line from Milwaukee, Wis., northward, via Fond du Lac and Appleton, is pending.

MILWAUKEE LIGHT, HEAT & TRACTION.—Surveys, it is said, are being made for the line from Watertown, Wis., to Beaverdam. This line now extends from Milwaukee west to Watertown, about 51 miles. It is the intention to build to Beaverdam next year and from that point to Fond du Lac, to connect with the interurban line of the Wisconsin Light, Heat & Traction Co. (Aug. 21, p. 788.)

NATCHEZ, COLUMBIA & MOBILE.—An officer writes that surveys are now being made on 3 miles of the extension, which has been under consideration for a long time, from near Loweton, Miss., east to Pearl river, 3.5 miles.

NEVADA-CALIFORNIA-OREGON.—An extension of this road has been finished from Likely, Cal., north to Alturas, 20 miles. (Aug. 7, p. 693.)

NORTH & SOUTH CAROLINA.—Incorporated in South Carolina, with a capital stock of $20,000, to build a railway from some point in Marlboro county, Ark., probably McColl, southeast to some point in Marion county, probably Dillon. W. R. Bonsal, President and Treasurer; J. E. Hancock, Vice-President, and S. O. Bauesfield, Secretary, all of Hamlet, N. C.

NORTHERN PACIFIC.—This company has bought from the Chicago, Milwaukee & St. Paul the power plant near Taft, Mont., preliminary to commencing work on a two-mile tunnel in the neighborhood of Lookout Mountain, Mont. The western end of the tunnel will be near Darsey, Idaho, and the eastern end near the St. Regis river. These improvements are to be made to straighten and shorten the present Northern Pacific line.

See Oregon & Washington.

OCILLA SOUTHERN.—An officer writes that contract has been given to R. S. Talmage, of Ocilla, for building this line. The projected route is from Ocilla south to Allapaha, 17 miles, thence to Nashville, 13 miles. J. A. J. Henderson, Ocilla, Chief Engineer. (November 13, p. 1374.)

OREGON & WASHINGTON.—This company has transferred to the Northern Pacific certain property lying east of the latter's main line in the city of Tacoma, Wash., and directly in line with the freight tracks in the 21st street yards; also certain other property lying between the Northern Pacific and the Chicago, Milwaukee & St. Paul, north of an interurban line.

OREGON ELECTRIC.—The Forest Grove division has been opened for business from Garden Home, Ore., west to Forest Grove, 19 miles. (R. R. G., May 15, p. 687.)

PEORIA & GALESBURG.—Incorporated in Illinois, with a capital stock of $100,000, to build an electric line from a point in or near Peoria, Ill., northwest through Peoria and Knox counties, to a point in or near Galesburg, and another line from Peoria through Peoria and Fulton counties, to a point in or near Canton. The incorporators include D. M. Mayer, A. C. Black, F. F. Atwood, of Peoria, and H. T. Dick, Chicago.

PORT JERVIS & DELAWARE VALLEY.—Incorporated in Pennsylvania, to build a seven-mile line from Matamoras, Pa., southwest to Milford, about 10 miles. The directors include: F. A. Sawyer, President, Canton, Pa.; C. F. Wright, I. H. Beardsley and J. S. Holden.

ROSCOE, SNYDER & PACIFIC.—An officer writes that work is now under way by Smith & Harrington, of Fluvanna, Tex., and Sammons & Snyder, of Snyder, on an extension from Snyder, Tex., northwest to Fluvanna, 19 miles. The company

was chartered to build from Roscoe, Tex., north to Portales, N. Mex., 230 miles. The road is now in operation from Roscoe to Snyder, 30.4 miles. Martin Duvall, Chief Engineer, Snyder. (Sept. 25, p. 1028.)

RUSTON, NATCHITOCHES & NORTHEASTERN.—An officer writes that surveys have just been made for this proposed line from Ruston, La., north to Farmerville, 26 miles. J. H. Nolan, President, Ruston.

SAN DIEGO, EL PASO & ST. LOUIS.—Final surveys, rights of way and sites for terminals will, it is said, soon be secured for this projected line. The proposed route is from El Paso, Tex., northeast through New Mexico to a point in Oklahoma not yet determined. (Nov. 13, p. 1374.)

SANOODY VALLEY.—J. B. Taylor & Co., Engineers and Contractors, Hudson Terminal building, New York, have been given a contract to build this line from DeKalb, Miss., to a connection with the Mobile & Ohio at Sucarnochee, Miss. (October 23, p. 1227.)

SANTA FE, LIBERAL & ENGLEWOOD.—An officer of the Santa Fe, Raton & Des Moines writes that work is under way by the Nevada Construction Co. of Raton, N. Mex., on an extension from Capulen, N. Mex., southwest to Cunningham, 13 miles. G. F. Martin is Chief Engineer of the S. F., R. & D. M., Raton.

SAVANNAH, AUGUSTA & NORTHERN.—This company was organized to build a line from Savannah, Ga., northwest to Chattanooga, Tenn,, with an easterly line to Augusta, in all about 425 miles. An officer writes that surveys are made from Statesboro, a point about 35 miles northwest of Savannah, to Chattanooga. Track has been laid on the first 25 miles from Statesboro to Garfield. Grading is finished from Garfield to Louisville, about 20 miles, and rights of way secured from Louisville to Commerce, in Jackson county, about 100 miles. (Sept. 25, p. 1028.)

SOUTHERN PACIFIC.—Construction work on the Nevada & California has been completed to Searles, Cal. This road extends from Owen Lake, Cal., south to Mojave, 120 miles. The distance from Searles to Mojave is 48.9 miles and this part of the road has been placed under operation. It will require two years to complete this road, which is being built primarily to assist in the construction of the Owen Lake aqueduct. There are at present about 3,000 men employed on this work.

SOUTHERN UTAH.—An officer writes that contract has been let to the Ely Construction Co., of Springville, for building 7 miles of railway east from Mill Creek coal mine, Utah. A further extension of 12 miles is projected from the proposed eastern terminus, east to the Denver & Rio Grande. J. F. Williams, Price, Utah, may be addressed.

SPOKANE & INLAND EMPIRE (ELECTRIC).—An officer writes that surveys are being made for an extension from Spokane, Wash., west and then north to a point at the junction of the Spokane and Columbia rivers, 73 miles. (Sept. 18, p. 982.)

SPOKANE, PORTLAND & SEATTLE.—The extension from Vancouver, Wash., south to Portland, Ore., 9.8 miles, has been finished and the road is now open for business from Portland, Ore., east to Pasco, Wash. (Nov. 13, p. 1374.)

TEXAS ROADS.—The Mount Pleasant Commercial Club, of which J. D. Moore is Secretary, wants to raise $600,000, it is said, for a railroad, of which 10 miles are built, and 40 miles additional are to be constructed.

TORRES, PRIETAS & REPRESO.—This company, operating 33 miles of railway from Torres, Sonora, on the Sonora Railway east to Prietas, an officer writes, is making surveys for an 80-mile extension to the Jaqui river.

UNION PACIFIC.—See Tacoma, Wash., under Railroad Structures.

VICTORIA & BARCLAY SOUND.—This company is being incorporated with powers, rights and privileges to build, equip and operate a railway from Victoria, B. C., via Otter Point and San Juan, to a point on Barclay sound, near the Sarita river. W. H. Langley, Victoria, B. C., is acting for the company.

WISCONSIN CENTRAL.—An officer writes that work is under way by Hannan & Hickey, contractors of Duluth, Minn., building 4.66 miles of line in Duluth, Minn. (R. R. G., April 17, p. 560.)

WISCONSIN ELECTRIC.—President C. C. Smith is formulating plans for extensions and improvements, which, it is said, will entail an expenditure of approximately $500,000. The power plant and car barn will be enlarged and the entire system in the city of Oshkosh, Wis., will be altered. (Oct. 23, p. 1228.)

Railroad Financial News.

CHICAGO, ROCK ISLAND & PACIFIC.—Speyer & Co., New York, have sold $9,000,000 first and refunding 4 per cent. bonds of 1904-1934 at 89, yielding 4¾ per cent. These bonds are part of an authorized issue of $163,000,000, of which there are $74,942,000 outstanding, including the $9,000,000 just sold.

DENVER, LARAMIE & NORTHWESTERN.—The proposal made by the company to the town of Fort Collins, Colo., to subscribe for $200,000 stock was rejected because the city could not raise that sum. The proposition made by the company was that the town should subscribe for $200,000 stock, conditionally on the completion of the road to Fort Collins and beyond. A resolution was adopted by the citizens to invite the chief officers of the road to meet a committee of citizens and submit some new proposal.

DETROIT, TOLEDO & IRONTON.—A temporary injunction has been issued restraining the United States Mortgage & Trust Co. and the Knickerbocker Trust Co. from selling $5,000,000 Detroit, Toledo & Ironton 4½ per cent. consolidated mortgage bonds, and $3,000,100 Ann Arbor preferred stock and $2,190,000 Ann Arbor common stock. These securities were pledged under $5,500,000 notes of the D., T. & I. (Nov. 13, p. 1376.)

ERIE.—Arrangements have been made with J. P. Morgan & Co., New York, for the extension until April 1, 1919, of the $2,800,000 outstanding Jefferson first mortgage 5 per cent. bonds of 1889-January 1, 1909.

INTERBOROUGH RAPID TRANSIT.—Lee, Higginson & Co., Boston, Mass., are offering $500,000 5 per cent. mortgage bonds of 1907-1952 at 102¾, to yield 4.85 per cent. The bonds of this company, which operates most of the subway and elevated lines in New York, are secured by a mortgage on the property, subject only to the city's rental.

MINNEAPOLIS & ST. LOUIS.—Redmond & Co., New York, are offering $1,000,000 first and refunding mortgage 4 per cent. bonds of 1899-1949 at 83, yielding about 5 per cent. Bonds are secured by first mortgage on about 276 miles of line, and subject to prior liens on about 355 miles in addition.

NORFOLK & SOUTHERN.—The reorganization committee, George C. Clarke, Sr., chairman, reports that over 75 per cent. of the outstanding bonds have been deposited. The time for the deposit of the first and refunding mortgage 50-year 5 per cent. bonds has been extended for a short time to admit of deposits of foreign holders. The amount of bonds of this class outstanding is $14,000,000, and there is about $6,000,000 in other forms of funded debt outstanding.

OREGON RAILROAD & NAVIGATION CO.—The *Portland Oregonian* publishes the following account of the extra dividend of 75 per cent. paid last February on both preferred and common stock, as shown by the testimony of Chief Clerk Staver, of the auditing department, in the hearing on tax assessments before the County Board of Equalization at Portland, Ore., on November 16:

"It was shown during the hearing yesterday that on February 18 of this year, at a meeting of the board of directors of the O. R. & N., dividends of 2 per cent. (semi-annual) and 75 per cent. (extra), or a total of 77 per cent., were declared on the preferred stock of the company. The preferred stock totals $11,000,000, on which, by the action of the board of directors February 18, total dividends of $8,470,000 were declared.

"At the same time on the common stock, which amounts to $24,000,000, dividends of 4 per cent. (annual) and 75 per cent. (extra), or a total of 79 per cent., were declared. The

dividends on this stock, accordingly, amounted to $18,960,000.

"The total dividends on the entire capitalization of the company, $35,000,000, amounted to $27,430,000. That amount was declared to be due and payable February 20.

"Not only is it contended that nearly all the stock of the O. R. & N. is owned by the Union Pacific, but that the Union Pacific borrowed of the O. R. & N. Company between $25,000,000 and $30,000,000. When the O. R. & N. declared the dividend of $27,000,000, it was virtually a matter of bookkeeping, inasmuch as the Union Pacific owns practically all the stock on which the dividends were declared and reserved practically the whole of the $27,000,000. The Union Pacific then repaid to the O. R. & N. the amount of its dividends in its loan. Consequently, according to the contentions of the O. R. & N. attorneys, the one wiped out the other."

WASHINGTON WATER POWER CO.—Stockholders have authorized an issue of $15,000,000 bonds, the proceeds to be used for improvements and extensions. The company besides its electric lighting business operates 96 miles of street and and interurban railway in and around Spokane, Wash. It has $5,001,900 stock and $1,600,000 bonds outstanding.

WISCONSIN CENTRAL.—The directors have declared a dividend of 4 per cent. for the year on the $11,267,104 4 per cent. preferred stock outstanding. This dividend, the first quarterly instalment of which is payable December 23, is the first dividend on the preferred stock since the present company was organized nine years ago. The preferred stock has the right to elect a majority of the directors on failure for two successive years to receive 4 per cent.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Seaboard Air Line is reported in the market for 15 locomotives. This item has not been confirmed.

The Missouri River & Northwestern expects to be in the market about February 1 for one mogul locomotive.

The Pittsburgh & Lake Erie is reported to be figuring on 10 passenger locomotives, instead of five, as reported in the *Railroad Age Gazette* of December 4. This item has not been confirmed.

The Harriman Lines have ordered for the Central Pacific two Mallet locomotives from the Baldwin Locomotive Works. They will have cylinders 26 in. and 40 in. x 30 in., and will weigh 430,000 lbs. each. This equipment was referred to under Union Pacific in the *Railroad Age Gazette* of November 20.

The Canadian Pacific is building at its Angus shops 10 consolidation engines and one articulated compound locomotive. The following specifications are those of the consolidation locomotives:

General Dimensions.

Weight on drivers	168,150 lbs.
Weight, total	192,350 "
Cylinders	22½ in. x 28 in.
Diameter of drivers	58 in.
Boiler, type	Wagon top
Boiler, working steam pressure	180 lbs.
Heating surface, total	2,797 sq. ft.
Tubes, number	240 (2-in.), and 24 (5-in.)
Tubes, length	14 ft. 1⅜ in.
Firebox	8 ft. 5⅛-in. x 5 ft. 5¼ in.
Grate area	43 sq. ft.
Water capacity	5,000 Imp. gals.
Coal capacity	10 tons

Special Equipment.

Axles	Mild steel
Bell ringers	Little Giant
Brake-beams	Simplex truss
Brake-shoes	C. P. R. standard
Couplers	Tower
Headlights	C. P. R. standard electric
Injectors	Hancock inspirator
Journal bearings	C. P. R. standard
Superheater	Vaughan-Horsey

The St. Louis Southwestern, as reported in the *Railroad Age Gazette* of December 4, has ordered 10 consolidation, 10 mogul freight, 6 Atlantic and 5 mogul switching locomotives from the Baldwin Locomotive Works. These are for January and February delivery.

General Dimensions.

Type	Consolidation
Weight on drivers	173,000 lbs.
Total weight	193,000 lbs.
Cylinders	22 in. x 30 in.
Diameter of drivers	48 in. centers, 3½ in. tires
Boiler, type	Standard wagon top
" working steam pressure	200 lbs.
" diameter	78 in.
Heating surface, total	2,752 sq. ft.
Tubes, number	346
" diameter	2 in.
" length	14 ft. 1¼ "
Firebox, length	120 "
" width	39¼ "
Grate area	32.5 sq. ft.
Tender, truck	Adams cast steel
Water capacity	7,500 gals.
Coal capacity	15 tons

Type	Mogul freight
Weight on drivers	140,000 lbs.
Total weight	160,000 lbs.
Cylinders	20 in. x 28 in.
Diameter of drivers	50 in. centers, 3½ in. tire
Boiler, type	Extended wagon top
" working steam pressure	200 lbs.
" diameter	68 in.
Tubes, number	292
" diameter	2 in.
" length	12 ft. ¾ "
Firebox, length	114¼ "
" width	39¼ "
Grate area	30.8 sq. ft.
Tender, truck	Adams cast steel
" water capacity	6,000 gals.
" coal capacity	12 tons

Type	Atlantic
Weight on drivers	90,000 lbs.
Total weight	168,000 lbs.
Cylinders	20 in. x 26 in.
Diameter of drivers	62 in. centers, 4 in. tires
Boiler, type	Extended wagon top
" working steam pressure	200 lbs.
" diameter	68 in.
Heating surface, total	2,460 sq. ft.
Tubes, number	292
" diameter	2 in.
" length	15 ft.
Firebox, length	114 in.
" width	39 "
Grate area	30.8 sq. ft.
Tender, style	Standard steel frame
" truck	Adams cast steel
Water capacity	6,000 gals.
Coal capacity	12 tons

Type	Mogul switching
Weight on drivers	137,000 lbs.
Total weight	155,000 lbs.
Cylinders	19 in. x 26 in.
Diameter of drivers	44 in. centers, 3½ in. tires
Boiler, type	Extended wagon top
" working steam pressure	200 lbs.
" diameter	66 in.
Heating surface, total	1,872 sq. ft.
Tubes, number	266
" diameter	2 in.
" length	12 ft. 3¼ "
Firebox, length	106 1/16 "
" width	39¼ "
Grate area	28.9 sq. ft.
Tender, truck	Adams cast steel
Water capacity	5,000 gals.
Coal capacity	12 tons

CAR BUILDING.

The Central Northern of Argentina is in the market for 700 freight cars.

The Cudahy Refrigerator Line, South Omaha, Neb., is figuring on a number of new cars.

The Missouri River & Northwestern expects to be in the market about February 1 for two gas-electric motor cars.

The United States Government has ordered two 25-ton wood box cars from the Youngstown Car Manufacturing Co.

The Western Maryland, reported in the *Railroad Age Gazette* of October 30 as asking prices on 500 hopper bottom cars, has ordered this equipment from the Cambria Steel Co.

The Illinois Central has ordered 19 steel coaches from the Pullman Co. These cars will be built according to the Harriman Lines specifications, except that they may have smoking compartments. The details of design are now being completed.

The New York, New Haven & Hartford, reported in the *Railroad Age Gazette* of November 6 as having ordered 100 passenger cars from Osgood Bradley & Sons, will divide this equipment as follows: Thirty non-vestibuled coaches, 25 ves-

tibuled coaches, 20 baggage and smoking cars, 10 non-vestibuled smoking cars, 5 vestibuled smoking cars, 5 horse and carriage cars, 2 mail and baggage, 2 combination baggage and express cars and 1 combination postal car.

The Canadian Northern, as reported in the *Railroad Age Gazette* of December 4, has ordered 1,000 thirty-ton box cars from Rhodes, Curry & Co., and 750 thirty-ton box cars from the Canada Car Co. The special equipment includes:

Brakes	Westinghouse
Bolsters, body and truck	Simplex
Brake-beams	Simplex

The Grand Trunk Pacific has ordered 500 box cars from Rhodes, Curry & Co. These cars will be 36 ft. long, 8 ft. 6 in. wide, and 8 ft. high, inside measurements, and 36 ft. 9¾ in. long and 9 ft. ¾ in. wide over all. The special equipment includes:

Bolsters and brake-beams	Simplex
Brakes	Westinghouse
Roofs	Hutchins metal
Door fixtures	Security

The Philippine Railways, through J. G. White & Co., New York, as reported in the *Railroad Age Gazette* of November 27, have ordered 12 thirty-ton Rodger convertible ballast cars from the Rodger Ballast Car Co. These cars will be 28 ft. 4 in. long, 7 ft. 2 in. wide, inside measurements, and 30 ft. long, 8 ft. 6⅜ in. wide, over all. The bodies and underframes will be of wood. The special equipment includes:

Brakes	Westinghouse
Brake beams	I-beam
Brasses	Brady Brass Co.
Draft gear	Miner
Dust guards	Wood
Wheels	Cast iron

The Grand Trunk, as reported in the *Railroad Age Gazette* of November 13, has ordered 1,000 fifty-ton hopper bottom gondola cars from the Pressed Steel Car Co. These cars will weigh 38,500 lbs. and will be 30 ft. ¼ in. long, 9 ft. 6 in. wide, inside measurements, and 31 ft. 6 in. long, 10 ft. 1½ in. wide and 10 ft. high, over all. The special equipment includes:

Axles	Open hearth steel
Bolsters, body	Plate and angle
Bolsters, truck	Pressed steel
Brakes	Westinghouse
Brake beams	Pressed steel
Brake shoes	Gray iron
Brasses	Pressed Steel Car Co.
Couplers	Climax steel
Door	Lind
Draft gear	Twin spring type
Dust guards	Basswood
Journal boxes	Gray iron
Paint	Carbon black
Side bearings	Steel
Trucks	Diamond arch-bar type
Wheels	Cast iron chilled, 33 in. diameter

The San Antonio & Aransas Pass, as reported in the *Railroad Age Gazette* of November 20, has ordered 500 wooden, 30-ton ventilated fruit and vegetable cars and 200 wooden 30-ton stock cars from the American Car & Foundry Co. The ventilated fruit and vegetable cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. 2 in. high, inside measurements, and 36 ft. 6⅝ in. long, 9 ft. ⅝ in. wide and 13 ft. 8¼ in. high, over all. The stock cars will be 35 ft. 7¾in. long, 8 ft. 2¼ in. wide and 7 ft. ¾ in. high, inside measurements, and 36 ft. 4 in. long, 8 ft. 9 in. wide and 12 ft. 6 in. high, over all. The special equipment includes:

Axles	Steel
Bolsters	Simplex
Brake beams	Simplex
Brake shoes	Steel back
Brakes	Westinghouse
Couplers, fruit cars	Major
Couplers, stock cars	Tower
Door fastenings, fruit cars	Security
Door fastenings, stock cars	Wrought iron
Draft rigging	Miner
Dust guards	Solid asbestos
Journal bearings	Eureka
Journal boxes, fruit cars	Symington
Journal boxes, stock cars	McCord
Paint	Eberson & Co.
Roofs	Murphy outside
Springs	American Steel Foundries
Wheels	33 in. cast iron

The Carolina, Clinchfield & Ohio, as reported in the *Railroad Age Gazette* of December 4, has ordered 2,250 steel gondola cars from the Pressed Steel Car Co. as follows: One thousand five hundred 50-ton hopper bottom steel coal cars which will weigh 39,000 lbs. each and will be 30 ft. 5 in. long and 9 ft. 6 in. wide, inside measurements, and 32 ft. 3 in. long, 10 ft. 1⅜ in. wide, 10 ft. 1⅜ in. high over all; 500 fifty-ton twin drop bottom steel gondola cars which will weigh 38,000 lbs. each and will be 40 ft. long, 9 ft. 7 in. wide, and 3 ft. 2 in. high, inside measurements, and 41 ft. 6 in. long, 10 ft. 2½ in. wide and 8 ft. 4 in. high over all; 250 thirty-ton steel underframe box cars which will weigh 30,000 lbs. each and will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements, and 36 ft. 10 in. long, 9 ft. 6 in. wide and 13 ft. 8½ in. high over all. The bodies of these latter cars will be of wood and the underframes of steel. The special equipment includes:

Bolsters, truck	Reliance
Brakes	Westinghouse
Brake beams	6-in. I-beams
Draft gear	Westinghouse
Journal boxes	Symington
Springs	Bartley
Wheels, 50-ton cars	Schoen steel
Wheels, 30-ton cars	Cast iron

IRON AND STEEL.

The Northern Pacific is in the market for 8,500 tons of structural steel.

The Cananea, Yaqui River & Pacific has ordered 4,000 kegs of spikes from the Illinois Steel Co.

The Atchison, Topeka & Santa Fe has ordered 500 tons of bridge steel from the American Bridge Co.

The Chicago, Rock Island & Pacific has ordered 20,000 kegs of spikes and 5,000 kegs of bolts from the Illinois Steel Co.

The Chicago, Milwaukee & St. Paul has ordered 25,000 kegs of spikes and 10,000 kegs of bolts from the Illinois Steel Co.

The Pennsylvania has been negotiating with rail manufacturers for several months concerning its 1909 rail requirements. It is close to an agreement as to the conditions under which rails of new specifications are to be rolled, but no contract has yet been made.

RAILROAD STRUCTURES.

BLOOMINGTON, IND.—The Chicago, Indianapolis & Louisville will rebuild the roundhouse recently burned. The new structure will be of brick and cost about $30,000.

DALLAS, TEX.—All the railways entering or owning terminal property in Dallas, except the Texas & Pacific, Houston & Texas Central and Texas & New Orleans, are interested in a new union passenger station. At a recent conference in Chicago of officials of the roads it was decided to have preliminary plans made for reference at the next meeting, to be held soon, at which time the details are to be more fully decided. It has been decided, tentatively, that the station, with train sheds and terminals, will require a minimum expenditure of $1,500,000.

DES MOINES, IOWA.—The Des Moines Union Railway, representing the Chicago Great Western, the Chicago, Burlington & Quincy, the St. Paul & Des Moines and the Wabash, has completed plans for a new passenger station to be built in East Des Moines. The building will be located on the site of the old depot at East Fifth street and the Des Moines Union tracks. It will be 30 ft. x 132 ft., one-story high, of brick construction. The plans have just been approved by the state railway commission. The structure is to be ready for use by May 1.

FT. WILLIAM, ONT.—Work was started November 21 on the large reinforced concrete elevator for the Grand Trunk Pacific. The general contract has been given to the James Stewart Co., Fisher building, Chicago. A sub-contract for the excavation work has been let to Seaman & Penniman, and another sub-contract to James Whalen for the pile driving, both of Ft. William. The work is to be pushed to completion. (Nov. 13, p. 1366.)

INDIANAPOLIS, IND.—The Board of Public Works and the Indianapolis Union Railway have agreed upon plans for the elevation of the railway tracks from Michigan to Prospect streets, between Keating avenue and La Salle street. The work of elevating the first section, including the East Washington street crossing, is to be commenced within 30 days after November 25, when final arrangements were made. The

total work will cost about $800,000, of which the railway will pay 75 per cent., the city 14 per cent. and the Indianapolis Traction & Terminal Co. the rest. The work is divided into four sections, one of which must be completed each year. The railway will do all the work and buy all the material.

Milwaukee, Wis.—The Chicago & North-Western is reported to have advised the Milwaukee civic organizations that the railway company is not in position to build the new Allis passenger station at National avenue until a year hence. W. A. Gardner, Vice-President of the company, is quoted as saying that the building of the new station will be deferred until the freight yards, which are now being extended, are completed. The railway company has given assurance that the new station will be built next year. (Nov. 20, p. 1415.)

Portland, Me.—The piers of the Grand Trunk at Portland were recently damaged by fire with a loss of about $400,000.

Portland, Ore.—The Southern Pacific is asking bids for the construction of a new passenger station to be erected at East First and Morrison streets. (Oct. 30, p. 1267.)

Quebec, Que.—Press reports from Montreal say that two important steps were taken last week in connection with the National Transcontinental Railway which the Canadian government plans to complete in 1910. The government paid $335,000 to the stockholders of the Quebec Bridge Co. and took over its assets preparatory to rebuilding the bridge across the St. Lawrence, which fell, when partly completed, in August, 1907, causing the death of 60 workmen. (Aug. 21, p. 782.)

Seattle, Wash.—The first steps have been taken by the Great Northern toward eliminating the conditions resulting from the fact that Railroad avenue extends the full length of the city along the water front where several thousand people are compelled to cross the freight tracks each day in going to and from the docks. Elevated sidewalks will be built from the docks to First avenue over the freight tracks.

Tacoma, Wash.—The Great Northern has made application to the city council for an entrance into the city. The road asks the city to vacate a triangular piece of ground that is now a part of the roadway at the intersection of Twenty-first street and Railroad avenue. This piece of ground covers approximately two acres and joins the 22 acres now owned by the railway company and will be used as switching yards and freight terminals. The Great Northern offers the city in return sufficient ground to increase the width of Twenty-first avenue from 80 ft. to 100 ft. The freight house is to be built at the corner of Railroad avenue and Twenty-first street, the terminal yards lying east and north of it. To build these terminals, the entire section will be raised about 4 ft. to bring it up to grade. As the Union Pacific and the Chicago, Milwaukee & St. Paul both cross River street at the same point where the Great Northern proposes crossing, it is probable that a viaduct will be built over the street to carry the tracks of all three roads.

Records, it is said, have been filed in the auditor's office of Pierce county by the Northwestern Improvement Co., the Northern Pacific and the Oregon & Washington, for the transfer of approximately 50 acres of tide land at Tacoma.

Bids were received on December 1 for the freight warehouse to be built by the Chicago, Milwaukee & St. Paul on the Puyallup river. These sheds are to be of wooden construction, 60 ft. x 550 ft. long, with 150-ft. platforms.

SIGNALING.

The Atchison, Topeka & Santa Fe expects to install during 1909 automatic electric signals between Chillicothe, Ill., and Edelstein, eight miles, and between Knox, Ill., and Cameron, 13.5 miles, all of which is double track; also a staff system between Highland Junction, Cal., and Summit, 23 miles, single track.

The Southern Pacific (Pacific System) has not definitely decided on plans for signal installations during 1909, but expects to install about 155 miles of continuous automatic block signals; also 15 interlocking plants, aggregating 380 movements; of these plants, nine will be operated jointly with other railway companies.

Hudson Tunnel Signals.

The Union Switch & Signal Co. contract for signals in the downtown tubes of the Hudson & Manhattan will consist of four electro-pneumatic interlocking plants and five miles of automatic block signaling. The interlockings comprise one 23-lever machine and three 11-lever machines, equipped with track circuit detector route locking, holding each switch locked until the train passes over it. All interlocking territory will be track circuited for the semi-automatic control of signals, locking of switches and control of the illuminated track diagrams. All interlocked signals will be semi-automatic in their control and such as lead with traffic will remain at stop after being passed until the signal lever is restored normal and again reversed, when, if the controlling track sections are free, the signal will again clear.

Each tower will have an illuminated track diagram repeating all track sections in the interlocking, as well as a certain number of sections to also show trains approaching and to show trains leaving the interlocking limits. All signals will also be repeated on this diagram. Complete approach locking will be provided for all high-speed movements. Complete train stop protection will be provided at all interlocked signals.

The 52 purely automatic signals will be of the home and distant "light" type. Their locations were shown in the diagram published in the *Railroad Age Gazette* of November 27, p. 1432. Each home signal operates in conjunction with an electro-pneumatic automatic train stop similar to those in the Interborough Rapid Transit subway, instead of electric motor stops, as now in service in the up-town tubes of the Hudson & Manhattan.

Two rail alternating current track circuits will be employed throughout the automatic signal territory between interlockings, and one rail alternating current track circuit within the interlocking limits. No batteries or direct-current will be used in the signaling, as all track, line, signal, light, switch and indication circuits will operate from alternating current secured from mains in each tunnel feeding through transformers. The a.c. signal mains will carry 1,100 volts and derive current from the railroad company's power-house in Jersey City.

Direct Current on the Pennsylvania.

The Pennsylvania has adopted the direct-current system of electric traction, with third rail conductor, for its New York and Long Island tunnel extension. This decision was reached after making its own independent experiments, and is the result of mature consideration of the entire subject in view of the special requirements of its tunnels, station and yards. This system of electric traction is now in use on the lines of the Long Island Railroad, with which lines the tunnel extension will be directly connected.

Use of Fuel Oil by Railways.

According to the report of the United States Geological Survey on the petroleum industry for 1907, nearly 18,855,691 barrels of oil were consumed that year as fuel by the railways of the United States. This is an increase of over 3,000,000 barrels above the amount used for the purpose during the preceding year. It is estimated that 13,593 miles of railway were operated by the use of fuel oil, and the total mileage by oil-burning locomotives is estimated at over 74,000,000.

Side-Door Subway Cars.

The New York Public Service Commission has extended to January 15 the time in which the Interborough Rapid Transit Co. is to demonstrate the advantages of the side door system in its cars by equipping two trains of eight cars each with side doors. The company asks further extension, the date named in the order being November 30, on the ground that it was experimenting with pneumatic devices for opening side doors from the platforms, and that the tests were not yet completed.

Supply Trade News.

The Eastern Granite Roofing Co., New York, has appointed A. E. Roever Sales Manager at Chicago, with office in the Monadnock block.

The Whiting Foundry Equipment Co., Harvey, Ill., is installing a 5-motor 20-ton electric traveling crane in the new steel car shops of the Pullman Co., at Pullman, Ill.

The Folger Locomotive Co., Tacoma, Wash., has been incorporated, with a capital stock of $1,000,000, by W. B. Jones, T. B. Egan, J. A. Van Osel, W. F. Schaffer, J. Loomis and L. W. Pratt.

The F. H. Niles Car Co., Chicago, has been incorporated to manufacture, sell and rebuild freight cars. The incorporators are E. Terwilliger, E. D. Pray and A. Hendrickson. Capital stock, $50,000.

The A. B. C. Bearing Corporation now has its principal offices in the Railway Exchange, Chicago. F. A. Lester, who is in charge of all sales and purchases, says that the company is prepared to handle promptly its rapidly growing business.

The W. K. Kenly Co., Chicago, has purchased the business and patents of the Western Railway Supply Co., Chicago, including the patents on the Latimer switch point lock and the Rizer guard rail block.

The Northern Railway Supply Co., Chicago, has been incorporated, with a capital of $5,000, to manufacture and sell railway supplies. The incorporators include J. F. O'Malley, H. W. Drew and A. W. Nondeck.

The Crane Co., Chicago, has given the contract to the C. L. Gray Construction Co., Memphis, Tenn., for the erection of a reinforced concrete warehouse at Memphis. It will be a three-story structure, having dimensions of 25 ft. x 100 ft., and will cost $80,000.

E. A. Stillman, son of F. H. Stillman, of the Watson-Stillman Company, New York, has entered the service of that company in the engineering department. He graduated from Cornell in the class of '08, having taken the mechanical engineering course.

The Canadian Palace Car Co. has been organized with $1,300,000 capital by A. J. Estes, G. S. Hart, F. H. Markey, R. C. Grant and W. G. Pugsley, of Montreal, to manufacture in Canada parlor, dining and sleeping cars on rights obtained from the American Palace Car Co., New York.

The Lunkenheimer Co., Cincinnati, Ohio, has recently been given a contract by the Isthmian Canal Commission, consisting of over 7,000 "Renewo" renewable seat and disc regrinding valves, ranging in sizes from ¼ in. to 3 in. This type of valve is guaranteed to withstand a working pressure of 200 lbs.

Grant W. Spear, who for many years has been Vice-President of the Dearborn Drug & Chemical Works, Chicago, took charge, November 1, of the general eastern offices of the company at 299 Broadway, New York, as Vice-President and Eastern Manager, W. B. McVicker being no longer connected with that company.

John L. Walker, Auditor of the Buda Foundry & Manufacturing Co., Chicago, has been appointed Manager of the "Use-Em-Up" drill socket department of the American Specialty Co., Chicago. This company has moved from the fourteenth floor to room 835 Monadnock block, where more commodious offices have been secured.

G. M. Basford, Assistant to the President of the American Locomotive Co., New York, will be Acting Secretary of the Railway Business Association for some time. For this purpose he will maintain an office at 2 Rector street, New York. This arrangement will involve no change in Mr. Basford's position with the American Locomotive Co.

J. N. Richards, until recently Manager of the Sales Department of the Standard Paint Co., New York, has associated himself with the Ernst Wiener Co., New York. Mr. Richards was with the Standard Paint Co. for 14 years, and for the last 10 years was in charge of the sales department. His new headquarters will be, for the present, at 50 Church street, New York.

The Link-Belt Company, Nicetown, Philadelphia, Pa., is at work on the following orders recently booked: Connecticut—Peck overlapping bucket carrier; Cuba: cane-unloading machinery; Florida: belt conveyors for phosphate rock; Newfoundland: bucket elevator and special chain conveyor for chips; Pennsylvania: a number of elevators, flight conveyors, apron, belt and screw conveyors, hoppers, etc., for coal, and pan conveyors for clinkers; West Virginia: gravity discharge elevator, apron feeder and car haul for coal.

The Minneapolis Steel & Machinery Co., Minneapolis, Minn., has been given the contract to install a new power plant for the Manhattan City & Interurban Railway Co., Manhattan, Kan. The machinery to be installed will include one 18 in. x 36 in. heavy duty Twin City Corliss engine, two 66 in. x 18 ft. horizontal return tubular boilers, one 200 kilowatt direct-current generator, switchboard, feed-water heater and purifier, boiler feed pump and other supplies.

J. B. Taylor & Co., Inc., has been organized in Delaware, with $500,000 capital stock. It will enter the field of engineering, construction, reorganization, and the financing of street railways, steam railways, water-works, gas, electric light, and other organizations. The general offices are in the Hudson Terminal buildings, New York. The company has already secured a contract to build the Sanoody Valley Railroad, connecting with the Mobile & Ohio at Sucarnochee, Miss., and is organizing an engineering and construction force.

W. B. McVicker, formerly Vice-President and Eastern Manager of the Dearborn Drug & Chemical Works, Chicago, has incorporated the W. B. McVicker Co., with offices in the United States Realty building, 115 Broadway, New York. Those associated with the company include Charles M. Eddy, Albert E. Carpenter, Joseph F. Hammill, William J. Schatz, G. Frank Duemler and Frank J. Schatz. A new laboratory and factory for general analytical work is under construction. The company will make a specialty of preparations for treating boiler feed waters and hydraulic systems.

The replacement of the destroyed Paris telephone switchboard, described in our issue of November 27, was completed November 30, being within the allotted time, by the Western Electric Co., Chicago. This is the second record made within a year by the Western Electric Co. for rapid telephone exchange replacement, the other being that of the Antwerp exchange—the oldest in Europe—for which a 5,000-line equipment was manufactured and installed in 30 days. The Paris contract covered a 10,000-line equipment, and while apparently involving but twice the labor of the other, in reality meant several times more.

November orders received by the Safety Car Heating & Lighting Co., New York, established a record over any month in the last two years. Equipment orders for 300 cars were received, mostly of the Harriman Lines. Besides paying dividends of 8 per cent. and 1 per cent. extra on the $9,862,000 stock, the company has accumulated a surplus, for the fiscal year ended December 31, of approximately $200,000. The gas sales for the year will show an increase of $25,000 over the preceding year. The forty-eight gas-producing plants of the company are now operating at full capacity and the assembling plant at Garwood, N. J., is running about at normal.

The U. S. Army has just put in commission the second of the two great hydraulic dredges, the "General C. B. Comstock" and the "Galveston," required for service in the Gulf of Mexico. Oil is used as the only fuel, the entire equipment being furnished by Tate, Jones & Co., Inc., Pittsburgh, Pa., makers of the Kirkwood burners. The latter of the two ships, the "Galveston," is of 2,000 i.h.p. capacity, four boilers being required. This ship was built after a thorough test of the "General C. B. Comstock," built some six years ago, and also equipped entirely by Tate, Jones & Co. The advantages found by the Government are economy in fuel cost, labor, space and time, greater mileage, lightness and control over the fire.

The receiverships of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., and of the Security Investment Co. have been terminated. E. C. Converse, of New York, has

been elected temporary Chairman of the Board of the first named company and will supervise the financial policy until a permanent chairman is elected. Other officers have been elected as follows: President, George Westinghouse; First Vice-President, E. M. Herr; Second Vice-President, L. A. Osborne; Acting Vice-Presidents, George W. Hebard and Walter M. McFarland; Secretary, Charles A. Terry; Treasurer, T. W. Siemon; Assistant Treasurers, E. St. John and H. F. Baltz; Auditor, J. C. Bennett, and Assistant Auditors, F. E. Craig and W. B. Covil, Jr.

Among the most important contracts received by the American Blower Co., Detroit, Mich., during November, up to the 24th of the month, are the following, the addresses being destinations of shipments: Detroit tilting traps—Northern Pacific, Livingston, Mont. A B C engines—Allis-Chalmers Co., Milwaukee, Wis., four generator sets; Canadian Westinghouse Co., Hamilton, Ont., one generator set; Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., two generator sets; Ft. Wayne Electric Works, Ft. Wayne, Ind., seven generator sets. Forced draft apparatus—Sandusky Portland Cement Co., Dixon, Ill.; Lincoln Traction Co., Lincoln, Neb.; Consolidated Power & Light Co., Pluma, S. Dak.; Central of Georgia Railroad Co., Savannah, Ga.; Sandusky Portland Cement Co., Syracuse, N. Y. Heating and ventilating apparatus—Roundhouse for Northern Pacific, Sand Point, Iowa.

Capt. Azel Ames, Signal Engineer Electric Zone, New York Central & Hudson River, has resigned his position and will become connected with the Kerite Insulated Wire & Cable Co., New York, maker of Kerite insulated wires and cables for aerial, underground and submarine purposes. His office will be at 30 Church street, New York City. Capt. Ames was born in 1873 at Wakefield, Mass. He prepared at Phillips Academy, Andover, and graduated, C.E., in 1895 from the Massachusetts Institute of Technology. He served on the Boston & Maine as a transit man, track laborer, sub foreman and assistant engineer, until, in 1898, he enlisted for the Spanish war. He became Captain, First Regiment, United States Volunteer Engineers, and served in Porto Rico. In the spring of 1899 he went to the New York Central & Hudson River as Assistant Roadmaster at West Albany, N. Y., and after a few months was made Supervisor of Track at High Bridge, N. Y. He won the prize for the best sub-division. In 1901 he was transferred to the Boston & Albany as Roadmaster of the Western division. The next year he was made Signal Engineer of the Boston & Albany, and in May, 1904, was appointed Signal Engineer of the Lake Shore & Michigan Southern. He returned to the New York Central & Hudson River in 1906 as Signal Engineer of the Electric Zone. Since July, 1907, Captain Ames has also served on the Block Signal and Train Control Board of the Interstate Commerce Commission. He is a member of the American Railway Engineering and Maintenance of Way Association and the Railway Signal Association, the Transportation Club and the Army and Navy Club, New York, and the Army and Navy Club, Washington. He is also Second Lieutenant, Coast Artillery Corps, National Guard of New York. It is not saying too much to mention that Captain Ames has the essentials, thoroughness and an unimpeachable character. Combined with these qualities, his restless energy should be of great value in his new work.

Capt. Azel Ames.

Peter Gray & Sons, Boston, Mass., are building a new factory at Cambridge, as their present plant in Boston is not large enough. It will be entirely occupied by them for the manufacture of lanterns and sheet metal work of various kinds. The main building is two stories high, 117 ft. x 54 ft., while directly in the rear is an ell 22 ft. x 34 ft., containing stairs, toilet rooms, elevator, etc. The basement of the main building will be used for manufacturing and storage, the first floor for shipping and offices, the second floor for manufacturing. The exterior walls will be built of common red brick, the framing of the interior to be of hard pine, mill construction. The construction of the building is arranged to take a possible future third story. Densmore & LeClear, Boston, are the architects and William Crane the builder. The building is at the corner of Binney and Third streets, and will be ready for occupancy next June.

The General Electric Co., Schenectady, N. Y., has the following recent orders for railway apparatus: Seattle Electric Co., Seattle, Wash.—Fifty four-motor GE-80 (40 h.p.) car equipments; four 1,000 k.w. motor generator sets converting 60 cyc. 13,200-volt current into 600-volt direct-current. These machines are provided with direct-connected exciters, the switchboard being included in the order. Four 1,000-k.w., 60-cyc., 13-200-volt air blast transformers with blowers. Denver City Tramway Co., Denver Colo.—Two 500-k.w., 25-cyc. rotary converters; seven 185-k.w. oil-cooled transformers. Sioux City Traction Co., Sioux City, Iowa.—Thirty GE-81 (30 h.p.) railway motors. Washington Water Power Company, Spokane, Wash.—Twenty four-motor GE-80 (40 h.p.) car equipments; two four-motor GE-73 (75 h.p.) car equipments with Sprague General Electric type "M" control. Pittsburgh Railways Co., Pittsburgh, Pa.—One 400-k.w. d.c. engine-driven generator; three 200-k.w., 60-cyc. rotary converters. Western New York Construction Company, Buffalo, N. Y.—Eight four-motor GE-204 (75 h.p. commutating pole) car equipments, with Sprague General Electric type "M" control.

TRADE PUBLICATIONS.

Centrifugal Fans.—B. F. Sturtevant Co., Hyde Park, Mass., has just issued Bulletin No. 158, which illustrates and describes steel plate electric, steam, turbine and propeller fans, etc.

Steam Turbines.—Bulletin No. 5,370, just issued by the Western Electric Co., New York, contains several half-tones and line cuts with a general description of the Rateau steam turbines.

Manila Rope.—Pamphlet No. 082, just issued by the C. W. Hunt Co., New York, illustrates and describes "Stevedore" rope which is used for rope driving, cargo hoisting falls and pile driving.

Valves.—The November issue of *The Valve World*, published by Crane Co., Chicago, contains an article on the evolution of steam heating by R. T. Crane, being a short review of papers heretofore printed.

Switch Point Lock.—The W. K. Kenly Co., Chicago, has issued a series of three postal cards calling attention to the Latimer switch point lock. An illustration of the device is shown upon the face of each card.

Tin.—Follansbee Bros. Co., Pittsburgh, Pa., has just issued a catalogue describing the general conditions governing the manufacture of tin plate together with the process, methods and raw materials employed in its making.

Concrete Slab Reinforcement.—The Northwestern Expanded Metal Co., Chicago, has recently issued a catalogue describing expanded metal used for roof and floor slabs. Several pages are devoted to tables of specifications for reinforcements.

Distributing Transformers.—Circular No. 1157, just issued by the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., describes in detail the Westinghouse type S distributing transformers. A large number of half-tone illustrations are given.

Valves.—A catalogue just issued by the American Steam Gage & Valve Manufacturing Co., Boston, Mass., illustrates and describes a large number of valves, including the American pop safety valves, cylinder relief valves, water relief valves, hydraulic relief valves, etc.

Sash Opening Apparatus.—Catalogue No. 6, recently issued by the Lord & Burnham Co., Irvington-on-Hudson, N. Y., de-

scribes in detail their apparatus for opening and closing hinged and pivoted sash. The catalogue contains a number of cuts and a list of some of their installations.

Graphite.—The December issue of this periodical, published by the Joseph Dixon Crucible Co., Jersey City, N. J., contains the seventh chapter of an article by W. H. Wakeman entitled "Preventing Corrosion of Steam Machinery." This particular chapter deals principally with turbines.

Denver & Rio Grande.—"Pine Crest," a summer resort among the pines of the Colorado mountains, is the subject of an unusually attractive and well illustrated pamphlet. A copy of the pamphlet and additional information regarding this resort may be obtained upon application to the Pine Crest Realty Co., Palmer Lake, Colo.

Steam Shovels and Dredges.—Bulletins No. 10,028, 10,029 and 10,014, just issued by the Atlantic Equipment Co., New York, contain a general description of steam shovels and dredges, with reports from users of the Atlantic steam shovels, also a number of line cuts and half-tones showing construction work in which these shovels and dredges are being used.

Curve Drawing Instruments.—Bulletin No. 4,627, recently issued by the General Electric Co., Schenectady, N. Y., contains matter descriptive of curve drawing instruments for a.c. and d.c. circuits. These instruments have been improved recently and the illustrations and descriptions in the bulletin are interesting. The bulletin also contains connections, dimension diagrams and prices.

The Obermayer Bulletin.—The Obermayer Bulletin of foundry information for October, issued by the S. Obermayer Co., Cincinnati, Ohio, contains several interesting articles on foundry practice, including an article entitled, "Save Part of What You Have Been Throwing Away," by R. H. Palmer, instructor in foundry practice of the Worcester Polytechnic Institute. There is also an illustrated article on the Chicago plant of the company.

National Association of Cement Users.—This association is distributing literature about the fifth annual convention to be held at Cleveland, Ohio, January 11 to 16. The reading matter includes a diagram of the floor space for exhibitors, with charge made for sections, space application blank, membership application blank and desk blotter. All inquiries regarding the convention or exhibition should be addressed to the association, Harrison building, Philadelphia, Pa.

Air Compressors for Industrial Service.—Publication No. 386, issued by the National Brake & Electric Co., Milwaukee, Wis., describes air compressors for industrial service, including type H motor-driven compressor, type L compressor, belted compressors, portable air compressor outfits, type 3VS compressors and combined air compressor and water pump units; also designs of air compressor governors. The catalogue is well illustrated. Several pages are devoted to tables showing dimensions, capacities and other data relating to the National manufactures.

Westinghouse Diary.—The Westinghouse Electric & Manufacturing Co., New York, has just issued the fifth edition of this diary, which contains more information of interest to engineers and users of power apparatus than any of the former ones. The diary is of vest-pocket size, bound in brown leather, and will undoubtedly be very useful as a ready reference for engineers. Special mention should be made of the following subjects, which are treated in this edition: High-pressure turbine, Leblanc condenser, low-pressure steam turbine, mechanical stoker, mercury vapor lamps, meter testing, storage battery, single phase railway systems, tungsten lamps, turbo pumps and blowers, and Westinghouse-Nernst lamps.

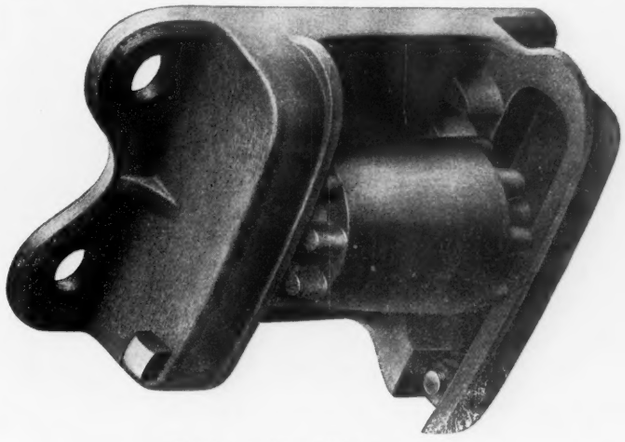
Pacific Northwest Literature.—The passenger department of the Oregon Railroad & Navigation and the Southern Pacific lines in Oregon issues a substantial pamphlet case containing profusely illustrated descriptions of points along the railroads, with particular reference to industrial opportunities. The plan is a new departure, in that part of the expense of each booklet is borne by the community especially interested in its publication. As a result, it has been possible to produce an enormous amount of exceedingly valuable material which is of great importance to home seekers in the West. Incidentally, the plan illustrates the mutual dependence and joint interest of the railway and the commonwealth better than volumes of testimony could.

Rolling Mill Machinery.—The United Engineering & Foundry Co., Pittsburgh, Pa., has just issued a very handsome catalogue, 8½ in. x 10 in., containing some 400 pages of heavily glazed paper substantially bound in cloth. The volume is probably as nearly a complete catalogue on the subject of rolling mill machinery as is possible to compile. The book contains over 300 half-tone illustrations, generally full-page, covering rolling mills, blooming, plate, universal, sheet and tin, continuous, merchant and guide bar mills and auxiliary machinery; plate bloom and slab shears; tin plate shears; lever shears; vertical shears and punches; hot and cold metal saws; roll turning lathes and straightening machines; tube works machinery, etc. A number of line drawings showing the layout of rail and billet mills designed and built by this company, include the largest rail and the largest billet mill, built for the Indiana Steel Co., at Gary, Ind.; the 28-in. rail and the 28-in. structural mills of the Bethlehem Steel Co., at South Bethlehem, Pa., and the blooming and sheet bar mill of the Andrews Steel Co., at Newport, Ky. These plants are also illustrated in part by half-tone illustrations, as are several of the various plants belonging to the United Engineering & Foundry Co. A large number of blooming mills have been built by this company, ranging in sizes from 24 in. to 44 in. A list of 27 of these plants contains some of the largest iron and steel plants in the country.

Stucki Roller Side Bearing.

The accompanying cut shows a side-bearing which works in all conditions of service and at the same time is simple in construction, as it consists of two ordinary castings: the roller and the housing.

The roller is free to travel on the ordinary truck side-bearing. If the bolsters are closed, it is moved in the ordinary way by friction; if the bolsters are apart, the teeth in the roller engaging the rack in the housing cause the roller to move just the same as if the bolsters were closed. Should the car be lifted off the truck, the roller cannot leave the housing, as there is a guide which engages the central projections of the roller. The whole device, therefore, is self-contained,



Stucki Roller Side Bearing.

but should it become necessary to remove the roller, this can easily be done by unscrewing two short bolts at one end of the side bearing.

The housing takes the place of the ordinary body side bearing, so that there is only one casting in addition to the ordinary construction. The housing as well as the roller is made of high carbon cast steel.

It is suggested that the ordinary truck side-bearing also be made of high carbon open-hearth steel, instead of the material commonly used. In addition to this, it is intended to slip plates of different thicknesses between the body bolsters and the side-bearing, until the clearance between the two parts is not over ⅛ in. In this way any blows due to lateral swaying will be avoided and the whole truck and car will be benefited.

In steel underframes and steel bolsters it is almost impossible to work to such close margins; by using these shims it will be much easier to get proper adjustment. As the roller is a part of the body side-bearing, the tendency to clog is minimized. As the roller always travels with the body bolster, it never centers and consequently never locks itself, no matter how great the angular movement of the bolster. Neither does it affect the swivelling of the truck in passing a curve,

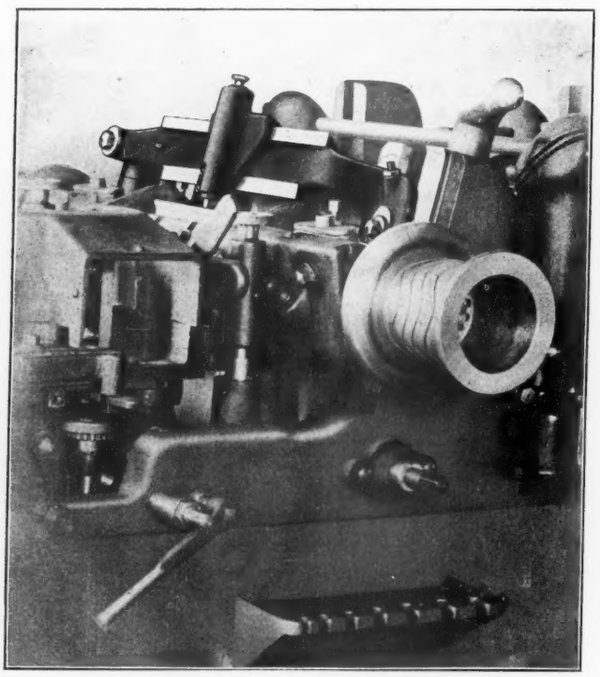
but if it is desired to center the truck by the side-bearings, it can be built that way by inclining the bearing on the housing.

This device is made by A. Stucki, Farmers' Bank building, Pittsburgh, Pa.

Woods Truing Devices.

Uniform knife work on a wood-planing machine requires a perfect running cutter-head in perfect running balance, perfect journals and boxes, thorough lubrication, uniformity in the temper of the knives, good grinding, the best possible setting, and finally the careful truing of the knife edges at running speed. It seems to be practically impossible to set cutter blades accurately when the head is not revolving, or to prevent their taking another form when in motion, as a consequence of which the knives will not follow exactly the same path. Although the differences are small, or even microscopic, they will be sufficient to leave their imprints on the surface of the wood. This distinctive mark, produced by one blade cutting deeper than the rest, is called a revolution mark. It is made once per revolution by the most prominent knife on the head, the others leaving less distinctive marks, or none at all. This term should not be confused with the so-called individual knife mark, left by each blade on a head which has been carefully trued at its regular cutting speed. The difference can be seen in the finish of the board, as the individual knife marks will be much closer together than the revolution marks.

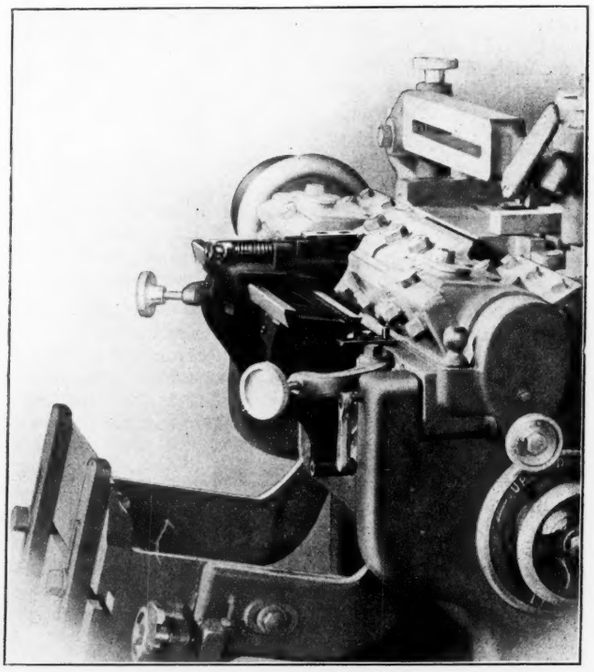
Although cutter-heads, in carefully conducted experiments, have been made as nearly accurate as possible, and the knives tested, while at rest



Woods Top Truing Device in Position.

with no apparent error, yet when this same head is put in motion a very prominent revolution mark has been made. This result was undoubtedly due to distortion under the influence of centrifugal strains, and also to the fact that the metal is not the same structure throughout, with the result that the blades ceased to run true when revolving at high speed. To overcome the effect of these centrifugal strains and the inaccuracies caused by errors in grinding and setting the knives, it is evidently necessary to true off the knife edges while the cutter-head is revolving at full speed. A method to accomplish this has been shown to be thoroughly practical. After the edges become dull another truing will restore them to good cutting condition. This process of resharpening can be repeated a number of times before it is necessary to remove the knives from the machine, on account of excessive heel being produced by the truing operation.

These devices are so designed that they can be put in operation without stopping the machine or changing the adjustment. Their general form varies according to the type and size of the machine and the location of the head. They embody a perfectly straight slide-bar, to which is attached the slide carrying an emery stick. The slide-bar is set parallel to the center line on the cutter-head. The slide is slowly moved from end to end while the cutter-head is revolving. Provision is made for adjusting the emery stick and holding it firmly against the work. The top truing device, shown in position on a No. 107 inside moulder, is a permanent fixture of the machine to which it is attached. The slide-bar is firmly hinged so that it may be swung into place in front of the cutter-head and when not in use may be swung back out of the way. On planers and matchers the slide-bar of the bottom truing device remains in position, the slide itself being drawn to one side when not in use. On the moulders the device is detachable, the drop table being swung down to permit attachment or removal. This feature is plainly shown in one of the accompanying illustrations. The side-head truing device may be used, rigidly held on the matcher plate. Vertical motion of the slide is given by screw and crank. Angular adjustment may be made for truing the cutter to



Bottom Truing Device in Position.

give a bevel edge on the stock. The device can be attached or removed while the machine is in motion.

Operators should be cautioned against excessive use of the truing device. If the knives be properly set the lightest possible touch of the emery stick should produce the desired result. A little care on the part of the operator, in not grinding away more metal than is necessary, will greatly reduce the accumulation of heel upon the knives, with the result that they will withstand many more applications of the truing device than if excessively worn away each time.

These truing devices are made by the S. A. Woods Machine Co., Boston, Mass.

Wood's Nipple End Hose Protector.

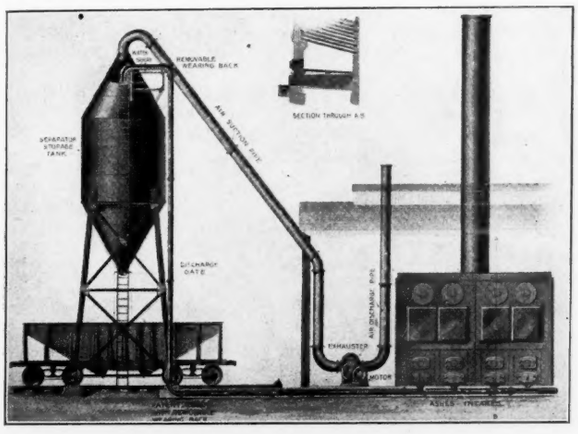
The natural life of air brake hose, so far as depreciation is due only to weather and bending, is nearly three years. An inspection of a pile of scrap hose will show that 75 to 85 per cent. of it has been damaged by abrasion at the brake pipe end and the average life when such damage is included is only 12 to 18 months. If the hose is protected at this point the loss by chafing and abrasion will be so reduced that a saving of 50 per cent. in air brake hose maintenance will be obtained. Wood's flexible wire cover, shown in the cut, accomplishes this very effectually. It is made of heavy steel spring wire and costs about 12½ cents each. This hose protector is now used in large numbers by the Santa Fe, the Lake Shore, the Burlington and the Armour Car Lines. It is sold by Guilford S. Wood, Great Northern building, Chicago.

Wood's Hose Protector.

Darley Suction Conveyor.

The accompanying illustration shows a complete suction conveyor system as applied to the boiler plant for handling ashes. This system consists of four essential parts, namely: Conveyor pipe, separator, exhauster and water jet.

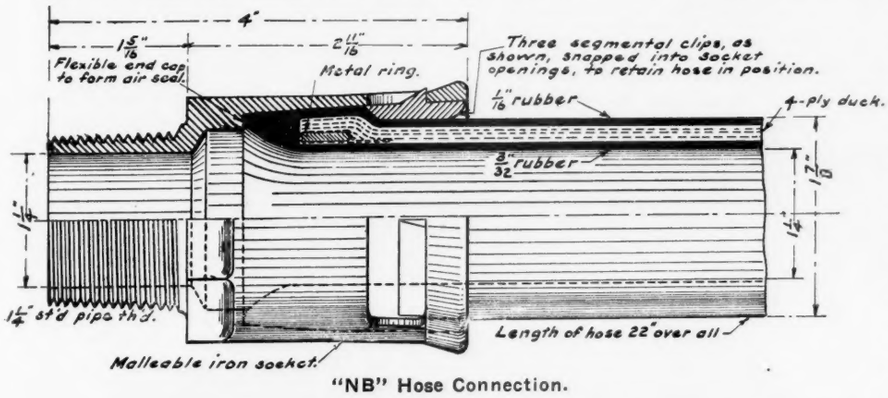
The conveyor pipe, of iron or steel, is made in three sizes and capacities as follows: 6-in., having a capacity of 200 lbs. per min., 8-in., 300 lbs. per min. and 10-in., 500 lbs. per min. Other sizes may be installed to meet any particular conditions. As far as possible the pipe is run in straight lines, generally placed beneath the surface,



Darley Suction Conveyor System.

Showing application for handling ashes from boilers.

but may be elevated or run in any direction to meet conditions. The separator, of any desired size, really an expansion chamber, also serves as a storage tank. This separator is always placed at the end of the conveyor run, where it serves to catch the material conveyed and hold it until it is drawn by gravity through an under-cut gate into receiving cars or barges. These separators may also be mounted over bins or bunkers, if such additional bin storage capacity is required. The separators are generally built of cylindrical form, of steel plate construction, with a conical top and bottom, but may also be made of concrete, either round or square, with a small conical steel plate top. These separators are always water tight. The exhauster



"NB" Hose Connection.

Hose With "NB" Fittings.

consists essentially of a rotating propeller surrounded by a suitable casing, with an intake air opening at the center and a discharge opening at the circumference. In appearance it is very similar to a centrifugal pump. While the efficiency depends largely upon the design of the impeller and casing and the proper shaping of the parts, these systems are not limited to any particular type of exhauster. For a small simple lay-out, an ordinary exhausting fan can be used, while for certain complicated systems, a cycloidal blower is best adapted. It may be either steam or motor driven, using alternating or direct current. These machines are very strong in construction, and it is said will operate under adverse conditions with a low maintenance cost. Just before entering the separator, the conveyed material passes through a water jet, located in the conveyor pipe. This jet has ⅛-in. holes spaced one in. centers, and serves a double purpose, as it removes the heat from such materials as ashes and also eliminates all dust. This latter provision acts to keep dust out of the exhauster.

In the case of an ash conveyor, the intakes are placed in front of the ash pit, the ashes being hoed or shoveled into the intakes. The diameter of the intake opening is slightly smaller than that of the pipe line, so that any piece of material which will pass the intake openings will be conveyed freely through the pipe line. As the most severe wear comes where the material is forced against the sides of the pipe where it changes direction, a patented split elbow, having an interchangeable wearing back made of hard iron about 3 in. thick, is used. These wearing backs are said to last from 10 to 18 months and are easily replaceable when worn out without interfering with the working of the conveyor. Patented fittings with interchangeable wearing backs are also used when required. Owing to the high velocity of the air in the central portion of the pipe, the tendency is to convey the material in suspension along the center line. This action prevents serious wear on the pipe, the principal wear being at the elbows, as before mentioned.

These conveyor systems are made by the Darley Engineering Co., 149 Broadway, New York.

Air Brake and Signal Hose Connection.

The George M. Newhall Engineering Co., Ltd., Philadelphia, Pa., is putting on the market the "NB" air brake and signal hose connection. This was designed by E. D. Nelson, Engineer of Tests, Pennsylvania Railroad, and W. L. Brown, his assistant.

The objects sought in designing this coupling were to avoid injury to the soft inner tube of the hose, which is an objection to the nipples used in the ordinary form of mounting, and to so fasten the hose to the metal parts that the hose would not be pulled off the fitting. In the "NB" coupling there is no contact of the metal parts with the soft rubber lining of the hose. The lining, being thus preserved against injury, is free to perform its function of sealing the hose structure against small leaks, which eventually may cause bursting. When the hose is inserted in the coupling, the clips, as shown in the drawing, are driven against the shoulder of the hose until the lugs on the clips spring into place through the aperture in the coupling. The hose is thus securely mounted without having anything in contact with the inner tube.

The strength of the hose depends primarily upon the ability of the duck wrapping or jacket to hold the pressure, but the safety of the hose against bursting depends absolutely on the integrity of the inner tube. A defect in the rubber lining permits air to find its way between and into the layers of duck, breaking through one or two of the inner layers and leaving only the outer layers to sustain the inner pressure. The pressure then, having only the remaining layers left, causes a rupture, and the result is a burst hose. The internal nipples now generally used are responsible for a large percentage of such failures, because the constant swinging of the hose is resisted by the end of the nipple against the soft rubber tube, cutting into it and permitting the air to escape through and into the duck wrappings. Records show that about 60 per cent. of hose failures in freight service are due to the bursting of hose at the nipples, and in passenger service the percentage is still higher.

Tests have been made with hose mounted with the present standard fittings, and with hose fitting with the "NB" coupling. They were pulled apart in the same way as occurs in service when cars are separated without the air brake coupling being uncoupled by hand. Repeating this a large number of times resulted in marked cutting of the nipple in the inner tube with the standard fitting, and no injury whatever to the inner tube with the "NB" fitting. Results in service bear out these tests, failures due to the bursting at the nipples being entirely eliminated with the "NB" couplings.

As to security against pulling off, repeated trials have shown that when mounted with the "NB" coupling the body of the hose has torn apart in every case, leaving the end of the hose still attached to the fitting.

The forms of air brake and signal couplings and threaded nipples

are the same as those in common use, so that there is no change in standard so far as the couplings and car fittings are concerned. "NB" hose and couplings can be mounted as quickly and as easily as the present M. C. B. standard, and the "NB" coupling has the decided advantage of being practically indestructible. All the parts can be used over and over again, whereas with the present system it is always necessary to have new bolts and nuts, and in most cases new bands for every mounting.

Arrangements have been made with several of the largest hose manufacturers to make this special end on the M. C. B. or individual railroad specifications hose, and sell it direct to the railroad companies. It can also be procured through the Newhall company.

Weed Killing System.

The work of the Railway Chemical Sprayer Co., Owensboro, Ky., incorporated in Kentucky with $200,000 capital stock, is to kill vegetation on railroad track. The company owns the patents for a sprayer car with which it can effectively kill all growing vegetation on the roadbed out to the ballast line. It uses a combination of chemicals mixed with water, the formula of which is secret.

Mounted on a flat car having a capacity of 50 tons are two 4,000-gal. tanks, with a cab in the center between the tanks. The cab contains a small mixing tank, air pump and the machinery necessary for operating the sprayer. After being thoroughly mixed by machinery, the chemicals are forced by air pressure into either of the large tanks, filled with water, which it is desired to use. This mixing of the chemicals and charging of the large tanks with them requires only about 15 minutes. The reason for using two tanks is that while spraying from one, the contents of the other are charged, permitting the work to go on without delay except for refilling the large tanks from the regular water service of the road. The 8,000 gallons of the solution contained in the two large tanks will spray about 15 miles of track, and as on most railroad systems there is a water tank every 15 or 20 miles, very little time is lost in refilling the tanks.

The vegetation begins to wilt within from 10 to 18 hours after the application, depending somewhat on the weather, and gradually dries up and blows away with the motion of the trains over it, leaving the roadbed perfectly clean. The chemical is absorbed by the plant and gets into the sap, thus passing to the points of the finest roots.

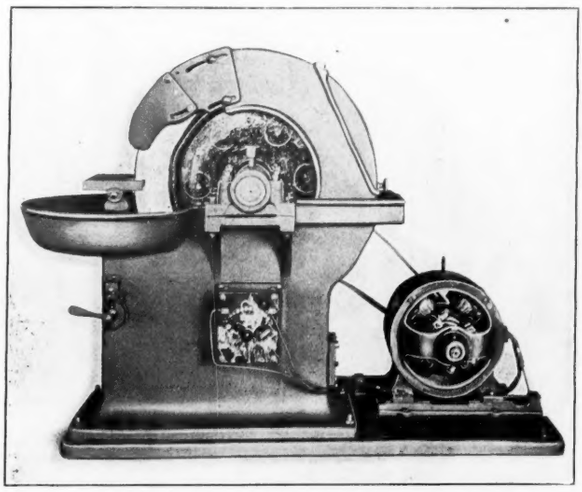
The company guarantees that its chemical solution is in no way injurious to the rails, ties, bond wires, paint, bridges or any part of the railroad equipment. It builds and owns the sprayers, making contracts with railroads at a fixed price per mile, and guaranteeing satisfactory work.

As this process kills absolutely roots and all growing vegetation on the roadbed, one application annually in the territory north of the Ohio river, put on, say, in June, when the vegetation is well out of the ground, keeps the roadbed practically free from vegetation for the entire season, so that the section gangs can use for putting the track in shape for winter the time that would otherwise be devoted to cutting weeds and grass.

During the past season, this company confined its activities to a series of experiments on the Illinois Central and the Yazoo & Mississippi Valley, between New Orleans, La., and Dubuque, Iowa, covering with satisfactory results, approximately 500 miles of track, including rock, slag, gravel and dirt ballast.

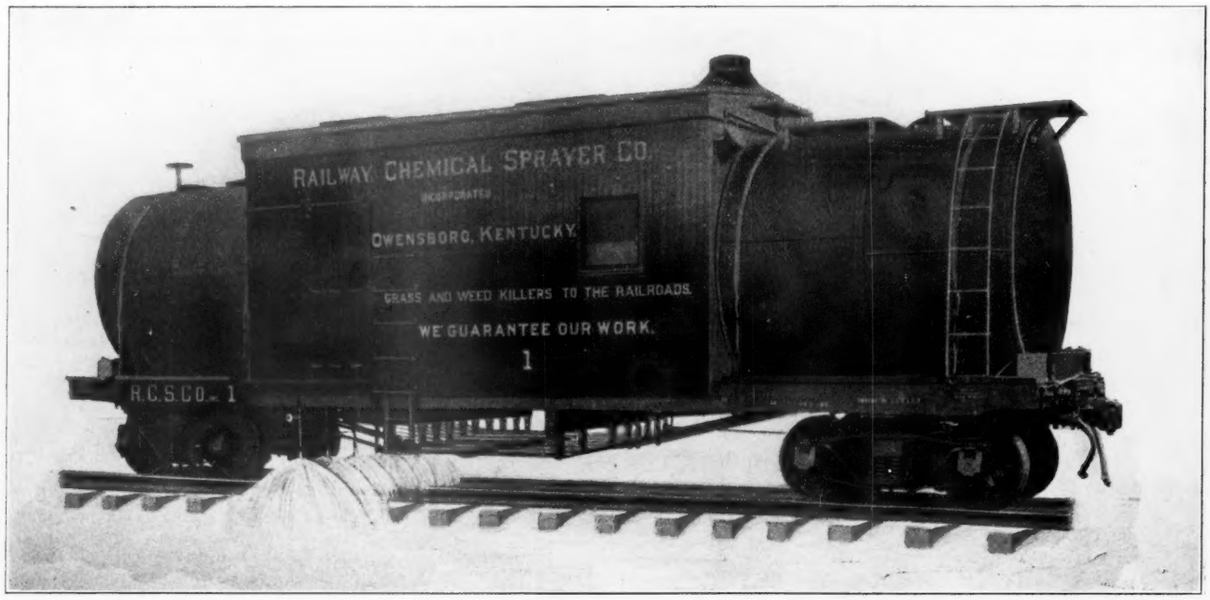
Electrically Driven Tool Grinder.

Perhaps among the first of the equipment in a machine shop to be driven by an individual electric motor in experimenting with electricity as a motive power is the tool grinder, since it seems to combine so many of the various advantages of electric drive. The tool grinder is often located apart from the rest of the machine tools and it often becomes difficult to make the necessary belt connections



Emery Wheel Driven by Westinghouse Motor.

where mechanical transmission is used. With a grinder such as is illustrated, it may be located where it will be most convenient to the machine tools, rather than with regard to making the belt connection. The Safety Emery Wheel Co., Springfield, Ohio, is supplying a 36-in. x 4-in. emery wheel, equipped with the standard Westinghouse d. c. type S. 4-h.p. motor. It runs at 1,175 r.p.m. and drives the emery wheel at 450 r.p.m. The starting device is conveniently located on the grinder, which provides a convenient method for regulating the speed. The illustration shows a constant-speed shunt motor, but the use of an adjustable motor is recommended, as the speed of the motor may be increased as the diameter of the emery wheel becomes smaller. The motor is mounted on an extended sub-base of the grinder and forms a flexible outfit in that it may be moved as a unit. Two operators may work on the grinder at the same time, as a door is provided in the rear of the hood as well as in the front. A wide pan in front and the apron in the rear prevents the water from splashing over the floor or the motor.



Weed Killing Car; Railway Chemical Sprayer Company.